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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648-XD394

Takes of Marine Mammals Incidental to Specified Activities; Marine Geophysical Survey in the Northwest Atlantic Ocean offshore North Carolina, September to October, 2014

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; issuance of an incidental harassment authorization.

SUMMARY: In accordance with the Marine Mammal Protection Act (MMPA) implementing regulations, we hereby give notice that we have issued an Incidental Harassment Authorization (Authorization) to Lamont-Doherty Earth Observatory (Lamont-Doherty) a component of Columbia University, in collaboration with the National Science Foundation (Foundation), to take marine mammals, by harassment, incidental to conducting a marine geophysical (seismic) survey in the northwest Atlantic Ocean off the North Carolina coast from September 15 through October 31, 2014.

DATES: Effective September 15, 2014, through October 31, 2014.

ADDRESSES: A copy of the final Authorization and application are available by writing to Jolie Harrison, Supervisor, Incidental Take Program, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910, by telephoning the contacts listed here, or by visiting the internet at:

[http://www.nmfs.noaa.gov/pr/permits/incidental/research.htm#ldeonsf\\_nc](http://www.nmfs.noaa.gov/pr/permits/incidental/research.htm#ldeonsf_nc).

The Foundation has prepared an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) and the regulations published by the Council on Environmental Quality (CEQ). LGL, Ltd. environmental research associates prepared the EA titled, “Draft Environmental Assessment of a Marine Geophysical Survey by the R/V Marcus G. Langseth in the Atlantic Ocean off Cape Hatteras, September–October 2014,” on behalf of the Foundation and Lamont-Doherty. We have also prepared an EA titled, “Issuance of an Incidental Harassment Authorization to Lamont-Doherty Earth Observatory to Take Marine Mammals by Harassment Incidental to a Marine Geophysical Survey in the Atlantic Ocean Offshore North Carolina, September through October, 2014,” and FONSI in accordance with NEPA and NOAA Administrative Order 216-6. To obtain an electronic copy of the application containing a list of the references used in this document, visit the internet at:

[http://www.nmfs.noaa.gov/pr/permits/incidental/research.htm#ldeonsf\\_nc](http://www.nmfs.noaa.gov/pr/permits/incidental/research.htm#ldeonsf_nc).

NMFS also issued a Biological Opinion under section 7 of the Endangered Species Act (ESA) to evaluate the effects of the survey and Authorization on marine species listed as threatened and endangered. The Biological Opinion is available online at:

<http://www.nmfs.noaa.gov/pr/consultations/opinions.htm>.

FOR FURTHER INFORMATION CONTACT: Jeannine Cody, NMFS, Office of Protected Resources, NMFS (301) 427-8401.

SUPPLEMENTARY INFORMATION:

Background

Section 101(a)(5)(D) of the Marine Mammal Protection Act of 1972, as amended

(MMPA; 16 U.S.C. 1361 et seq.) directs the Secretary of Commerce to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals of a species or population stock, by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if, after NMFS provides a notice of a proposed authorization to the public for review and comment: (1) NMFS makes certain findings; and (2) the taking is limited to harassment.

Through the authority delegated by the Secretary, NMFS (hereinafter, we) shall grant an Authorization for the incidental taking of small numbers of marine mammals if we find that the taking will have a negligible impact on the species or stock(s), and will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant). The Authorization must also prescribe, where applicable, the permissible methods of taking by harassment pursuant to the activity; other means of effecting the least practicable adverse impact on the species or stock and its habitat, and on the availability of such species or stock for taking for subsistence uses (where applicable); the measures that we determine are necessary to ensure no unmitigable adverse impact on the availability for the species or stock for taking for subsistence purposes (where applicable); and requirements pertaining to the mitigation, monitoring and reporting of such taking. We have defined "negligible impact" in 50 CFR 216.103 as "an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival."

Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to

injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or

(ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

### Summary of Request

On February 26, 2014, we received an application from Lamont-Doherty requesting an Authorization for the take of marine mammals, incidental to conducting a seismic survey offshore Cape Hatteras, NC September through October, 2014. We determined the application complete and adequate on July 15, 2014 and published a notice of proposed Authorization on July 31, 2014 (79 FR 44549). The notice afforded the public a 30-day comment period on our proposed MMPA Authorization.

Lamont-Doherty, with research funding from the Foundation, plans to conduct a high-energy, 2-dimensional (2-D) seismic survey on the R/V Langseth in the Atlantic Ocean approximately 17 to 422 kilometers (km) (10 to 262 miles (mi)) off the coast of Cape Hatteras, NC for approximately 33 days during the period of September 15 to October 31, 2014. The proposed activity will generate increased underwater sound during the operation of the seismic airgun arrays. Thus, we anticipate that take, by Level B harassment only, of 30 species of marine mammals could result from the specified activity.

### Description of the Specified Activity

#### Overview

Lamont-Doherty plans to use one source vessel, the R/V Marcus G. Langseth (Langseth), seismic airgun arrays configured with 18 or 36 airguns as the energy source,

one hydrophone streamer, and 94 ocean bottom seismometers (OBS) to conduct the conventional seismic survey. In addition to the operations of the airguns, Lamont-Doherty proposes to operate a multibeam echosounder, a sub-bottom profiler, and acoustic Doppler current profiler on the Langseth continuously throughout the proposed survey. However, they would not operate the multibeam echosounder, sub-bottom profiler, and acoustic Doppler current profiler during transits to and from the survey area.

The purpose of the research seismic survey is to collect and analyze data on the mid-Atlantic coast of the East North America Margin (ENAM). The study would cover a portion of the rifted margin of the eastern U.S. and the results would allow scientists to investigate how the continental crust stretched and separated during the opening of the Atlantic Ocean and magnetism's role during the continental breakup. The proposed seismic survey is purely scientific in nature and not related to oil and natural gas exploration on the outer continental shelf of the Atlantic Ocean.

#### Dates and Duration

Lamont-Doherty proposes to conduct the seismic survey from the period of September 15 through October 22, 2014. The study would include approximately 792 hours of airgun operations (i.e., a 24-hour operation over 33 days). Some minor deviation from Lamont-Doherty's requested dates of September 15 through October 22, 2014, is possible, depending on logistics and weather conditions. Thus, this Authorization will be effective from September 15, 2014 through October 31, 2014. Lamont-Doherty will not conduct the survey after October 31, 2014 to avoid exposing North Atlantic right whales (Eubalaena glacialis) to sound at the beginning of their migration season.

### Specified Geographic Region

Lamont-Doherty proposes to conduct the seismic survey in the Atlantic Ocean, approximately 17 to 422 kilometers (km) (10 to 262 miles (mi)) off the coast of Cape Hatteras, NC between approximately 32 - 37° N and approximately 71.5 - 77° W (see Figure 1 in this notice). Water depths in the survey area are approximately 20 to 5,300 m (66 feet (ft) to 3.3 mi). They would conduct the proposed survey outside of North Carolina state waters, within the U.S. Exclusive Economic Zone, and partly in international waters.

### Detailed Description of Activities

#### Transit Activities

The Langseth would depart from Norfolk, VA and transit for approximately one day to the survey area. Setup, deployment, and streamer ballasting would occur over approximately three days and seismic acquisition would take approximately 33 days. At the conclusion of the proposed survey, the Langseth would take approximately one day to retrieve gear. At the conclusion of the proposed survey activities, the Langseth would return to Norfolk, VA.

#### Vessel Specifications

We outlined the vessel's specifications in the notice of proposed Authorization (79 FR 44549, July 31, 2014). The descriptions of the vessel's specifications have not changed between the proposed Authorization and our final Authorization.

#### Data Acquisition Activities

We outlined the details regarding Lamont-Doherty's data acquisition activities using the airguns, hydrophone streamer, ocean bottom seismometers, multibeam echosounder, sub-bottom

profiler, and acoustic Doppler current profiler in the notice of proposed Authorization (79 FR 44549, July 31, 2014).

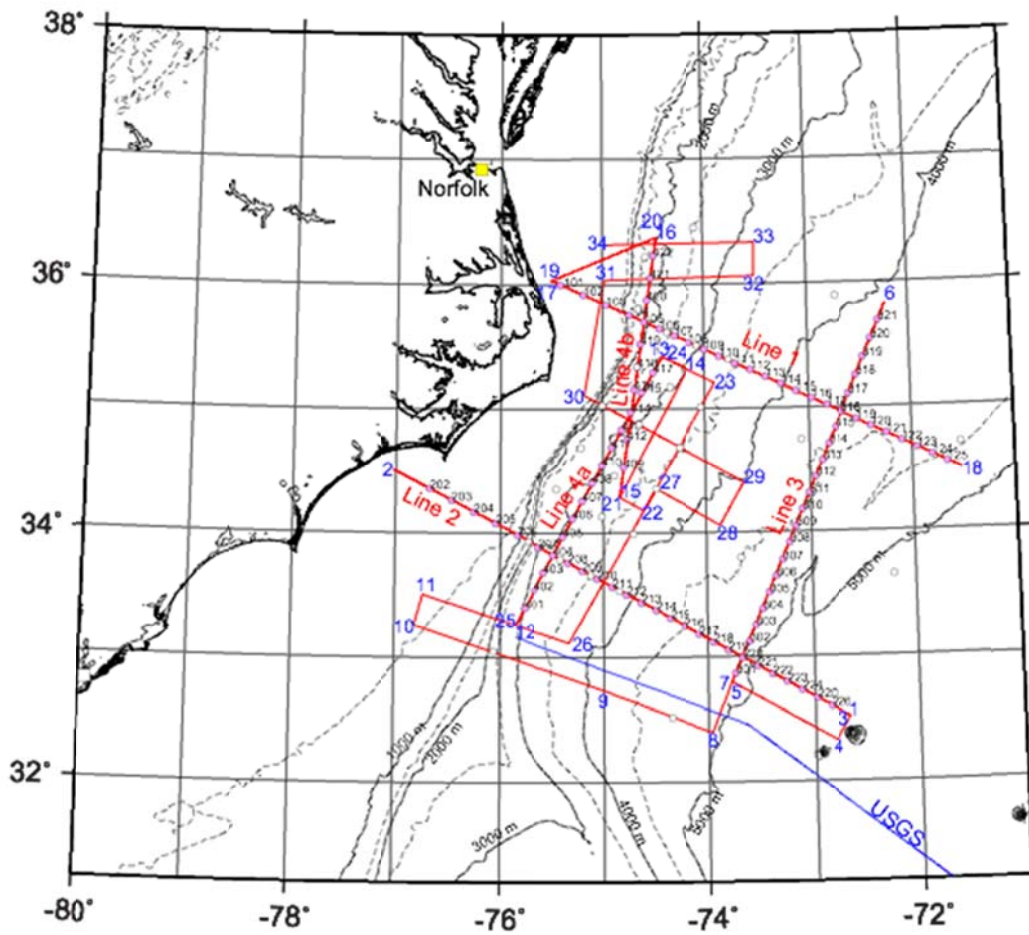
We would like to clarify some information about the acquisition activities presented in the proposed notice of Authorization here. In summary, the survey would cover approximately 5,320 kilometers (km) (3,306 miles (mi)) of transect lines (approximately 1,900 km (1,180 mi) for the multi-channel seismic tracklines and approximately 3,420 km (2,125 mi) for the ocean bottom seismometer tracklines within the survey area. This represents a 1,030 km (640 mi) reduction in transect lines from Lamont-Doherty's original proposal in their application that totaled 6,350 km (3,946 mi).

During the survey, the Langseth crew would deploy a four-string array consisting of 36 airguns with a total discharge volume of approximately 6,600 cubic inches (in<sup>3</sup>), or a two-string array consisting of 18 airguns with a total discharge volume of 3,300 in<sup>3</sup> as an energy source. The Langseth would tow the four-string array at a depth of approximately 9 m (30 ft) and would tow the two-string array at a depth of 6 m (20 ft).

Lamont-Doherty would deploy a total of 94 seismometers along five different tracklines that would be ensonified twice using the four-string array consisting of 36 airguns. The first pass over the trackline would acquire seismometer data and the second pass would record source shots with the multi-channel seismic portion of the survey. On average, for a 400-km (248 mi) line segment, the Langseth traveling at 8.3 km/hour would take approximately four days to complete the acquisition for the seismometer trackline. In total, there are 10 tracklines that would require repeat coverage (Figure 1, Lines 1 through 4b).

Last, for this survey, Lamont-Doherty has informed us that they would not operate the multibeam echosounder, sub-bottom profiler, and acoustic Doppler current profiler during transits to and from the survey area.

Figure 1 – Proposed Langseth ship track for the ENAM 2014 seismic survey, September – October, 2014. Five transects will be shot twice, once for OBS and once for MCS data acquisition. The larger numbers show the order in which the Langseth will follow this track beginning with Point #1 in the southeast corner of the map.





Other than these clarifications, there has been no change to Lamont-Doherty's data acquisition activities as described in the proposed Authorization (79 FR 44549, July 31, 2014). For a more detailed description of the authorized action, including vessel and acoustic source specifications, metrics, characteristics of airgun pulses, predicted sound levels of airguns, etc., we refer the reader to the notice of proposed Authorization (79 FR 44549, July 31, 2014) and associated documents referenced above this section.

### Comments and Responses

We published a notice of receipt of Lamont-Doherty's application and proposed Authorization in the Federal Register on July 31, 2014 (79 FR 44549). During the 30-day public comment period, we received comments from nine private citizens and the following organizations: the Marine Mammal Commission (Commission); Natural Resources Defense Council and Center for Biodiversity (hereafter referred to as NRDC et al.); the Town of Nags Head, NC; the Town of Kill Devil Hills, NC; and the Marcus Langseth Science Oversight Committee (MLSOC). We posted these comments online at <http://www.nmfs.noaa.gov/pr/permits/incidental/research.htm>.

We address any comments specific to Lamont-Doherty's application that address the statutory and regulatory requirements or findings that we must make in order to issue an Authorization. Following is a summary of the public comments and our responses.

#### Effects Analyses

Comment 1: The Commission recommends that we adjust density estimates using some measure of uncertainty when available density data originate from different geographical areas and temporal scales and that we formulate a consistent policy for how applicants should incorporate uncertainty into their density estimates.

Response: The availability of representative density information for marine mammal species varies widely across space and time. Depending on survey locations and modeling efforts, it may be

necessary to consult estimates that are from a different area or season, that are at a non-ideal spatial scale, or that are several years out of date. As the Commission notes in their letter to us, we continue to evaluate available density information and are continuing progress on guidance that would outline a consistent general approach for addressing uncertainty in specific situations where certain types of data are or are not available.

Comment 2: The Commission recommends that we follow a consistent approach for requiring the assessment of Level B harassment takes for sub-bottom profilers, echosounders, sidescan sonar, and fish-finding sonar by applicants who propose to use them. The Commission also recommends that the Authorization prohibit the operation of the multi-beam echosounder, sub-bottom profiler, and acoustic Doppler current profiler during transit.

Response: We acknowledge the Commission's recommendation and note that we continue to work on a consistent approach for addressing potential impacts from active acoustic sources.

For this survey, we assessed the potential for multi-beam echosounder, sub-bottom profiler, and acoustic Doppler current profiler operations to impact marine mammals with the concurrent operation of the airgun array. We assume that, during simultaneous operations of the airgun array and the other active acoustic sources, a marine mammal close enough to be affected by the other active acoustic sources would already be affected by the airguns. Because Lamont-Doherty will not operate the multibeam echosounder, sub-bottom profiler, and acoustic Doppler current profiler during transits when the airgun array is not active, we will not require an assessment of Level B harassment takes for those sources for this survey, and we have not authorized take from these other sound sources. The Authorization includes language restricting the use of these devices during transit.

Comment 3: The Commission recommends that we require Lamont-Doherty to power down the airgun array when observers see concentrations of six or more humpback, sei, fin, blue, and/or sperm whales within the Level B harassment zone.

Response: We agree with the Commission's recommendation and have included a new mitigation measure within the Authorization that requires the Langseth to power down the airgun array when protected species observers see concentrations of six or more humpback, sei, fin, blue, and/or sperm whales.

Comment 4: The Commission described our proposed requirement for the Langseth to conduct the survey (especially when near land) from the coast (inshore) and proceed towards the sea (offshore) to the maximum extent possible. The Commission agrees with this requirement, but recommends that we remove the qualifying phrase "...to the maximum extent practicable..." within the Authorization.

Response: Lamont-Doherty has planned the survey to comply with the requirement to conduct acquisition activities from the coast in a seaward direction to the maximum extent practicable. However, this requirement may not be practicable in all situations. In a few cases, Lamont-Doherty must acquire data (see Lines 1 and Lines 2 in Figure 1 in this notice) transiting towards the coast to meet their research goals such as when switching from an OBS line to a MCS line. We have evaluated the commenter's recommendation and Lamont-Doherty's reasons for why the measure may (or may not) be practicable and have concluded that after taking into consideration the project's purpose, there is no practicable alternative for Lamont-Doherty's proposed acquisition activities. Thus, for this Authorization we will not remove the qualifying phrase to the maximum extent practicable.

Comment 5: The Commission states that Lamont-Doherty changed its proposal to use 18-airgun configuration during the MCS portion of the survey instead of the originally proposed

36-airgun configuration for the same tracklines. Because Lamont-Doherty still plans to use the 36-airgun configuration during the OBS portion of the survey, which would occur in water depths as shallow as 20 m, the Commission questions the need for the larger airgun array and OBS devices in shallow water and seeks justification for the use of the 36-airgun array to obtain data in shallow water. Further, if the researchers can obtain the same quality of data using the smaller 18-airgun configuration, they recommend we require Lamont-Doherty to use the 18-airgun configuration to minimize impacts on marine mammals.

Response: Lamont-Doherty requires the larger 36-airgun array to first acquire wide-angle seismic data on the OBSs and to record source shots on the MCS streamer. Lamont-Doherty has informed us that it is not practicable to use the 18-airgun array configuration to obtain data on the OBS tracklines because the reflection and refraction surveys achieve different scientific goals (i.e., they reveal different geologic aspects and targets). We have considered this rationale and Lamont-Doherty's reasons for why the measure may (or may not) be practicable. After taking into consideration the project's purpose, we agree with Lamont-Doherty that there is no practicable alternative for Lamont-Doherty's proposed use of the 36-airgun array for OBS tracklines. Thus, for the reasons stated, we will not require the use of the 18-airgun array configuration for the OBS tracklines.

Comment 6: The Commission expressed doubt about Lamont-Doherty's use of in-situ measurements from Diebold et al. (2010) to estimate the proposed exclusion zones for the 18-airgun array in shallow water. They question Lamont-Doherty's use of the hydrophone data from the Gulf of Mexico calibration study which they believe sampled sound propagation measurements at 50 meters (m) (164 feet (ft)) depth instead of the 20 m (66 ft) water depth proposed for the survey. They assert that Lamont-Doherty used an invalid methodology to derive exclusion zones and does not support the use of the Diebold et al. (2010) method for shallow water.

Response: Lamont-Doherty's application (LGL, 2014) and Appendix A in the Foundation's EA (NSF, 2014) describe the approach to establishing mitigation exclusion and buffer zones. For this survey, Lamont-Doherty developed the shallow-water exclusion and buffer zones for the 18-airgun array based on the empirically derived measurements from the Gulf of Mexico calibration survey (Fig. 5a in Appendix H of the Foundation's PEIS). Diebold et al. (2010) showed that Lamont-Doherty's model produced appropriate mitigation radii for shallow water.

Lamont-Doherty used a similar process to develop mitigation radii for a shallow-water seismic survey in the northeast Pacific Ocean offshore Washington in 2012. The Observatory conducted the shallow-water survey using a similar airgun configuration (6,600 in<sup>3</sup>) and recorded the received sound levels on the shelf and slope off Washington using the Langseth's 8-km hydrophone streamer. Crone et al. (2013) analyzed those received sound levels from the 2012 survey and reported that the actual distances for the exclusion and buffer zones were two to three times smaller than what Lamont-Doherty's modeling approach predicted. While results confirm the role that bathymetry plays in propagation, it also confirmed that empirical measurements from the Gulf of Mexico survey over-estimated the size of the exclusion zones for the Washington survey. Lamont-Doherty presented these preliminary results in a poster session at the American Geophysical Union fall meeting in December 2013 (Crone et al., 2013; available at: <http://berna.ldeo.columbia.edu/agu2013/agu2013.pdf>). They anticipate publishing their results in a peer-reviewed journal in 2014. When available, we will review and consider the final results and how they reflect on the Lamont-Doherty model and will continue to work with Lamont-Doherty on verifying the accuracy of their model.

Comment 7: The Commission does not support the methodology that Lamont-Doherty uses to obtain deep-water exclusion and buffer zones. Citing Figures 11, 12, and 16 in Appendix H of the Foundation's Programmatic Environmental Impact Statement for geophysical surveys, they note

that the calibration data show that at greater distances (4 to 5 km) the actual sound levels reflected and refracted from the seafloor and sub-seafloor rise very close to the mitigation model curve. The Commission states that Lamont-Doherty should use site-specific modeling to account for reflective or refractive arrivals which would address their concerns with their model.

The Commission further recommends that we require Lamont-Doherty to re-estimate the proposed zones and take estimates using site-specific parameters (including at least sound speed profiles, bathymetry, and sediment characteristics) for the proposed Authorization. They also recommend that we require the same for all future incidental harassment authorization requests from Lamont-Doherty.

Response: Lamont-Doherty acquired field measurements for several array configurations at shallow- and deep-water depths during acoustic verification studies conducted in the northern Gulf of Mexico in 2003 (Tolstoy et al., 2004) and in 2007 and 2008 (Tolstoy et al., 2009). Based on the empirical data from those studies, Lamont-Doherty developed a sound propagation modeling approach that conservatively predicts received sound levels as a function of distance from a particular airgun array configuration in deep water.

In 2010, L-DEO assessed their accuracy of their modeling approach by comparing the sound levels of the field measurements in the Gulf of Mexico study to their model predictions (Diebold et al., 2010). They reported that the observed sound levels from the field measurements fell almost entirely below the predicted mitigation radii curve for deep water (Diebold et al., 2010). Based on this information, their current modeling approach reliably estimates mitigation radii in deep water and represents the best available information to reach our determinations for the Authorization. We considered reflected and refracted arrivals in reviewing their model's results and note that the comparisons of Lamont-Doherty's model results and the field data collected in the Gulf of Mexico and Washington illustrate a degree of conservativeness built into their model for deep water. Given

that Lamont-Doherty has demonstrated that the model is conservative in deep water, we conclude that the model is an effective means to aid in determining potential impacts to marine mammals from the planned seismic survey and estimating take numbers, as well as establishing buffer and exclusion zones for mitigation.

We acknowledge the Commission's concerns about Lamont-Doherty's current modeling approach for estimating exclusion and buffer zones and also acknowledge that Lamont-Doherty did not incorporate site-specific sound speed profiles, bathymetry, and sediment characteristics of the research area within the current approach to estimate those zones for this Authorization. However, as described earlier (and in Comment 6), empirical data collected at two different sites and compared against model predictions indicate that other facets of the model (besides the site-specific factors cited above) do result in a conservative estimate of exposures in the cases tested. At present, Lamont-Doherty cannot adjust their modeling methodology to add the environmental and site-specific parameters as requested by the Commission. We are working with Lamont-Doherty and the Foundation to explore ways to better consider site-specific information to inform the take estimates and development of mitigation measures in coastal areas for future seismic surveys with Lamont-Doherty. Also, the Foundation is exploring different approaches in collaboration with Lamont-Doherty and other academic institutions with whom they collaborate. When available, we will review and consider the final results from Lamont-Doherty's expected publications (See our response to Comment 6).

Lamont-Doherty has conveyed to us that additional modeling efforts to refine the process and conduct comparative analysis may be possible with the availability of research fund and other resources. Obtaining research funds is typically through a competitive process, including those submitted to federal agencies. The use of models for calculating buffer and exclusion zone radii and developing take estimates are not a requirement of the MMPA incidental take authorization process.

Furthermore, our agency does not provide specific guidance on model parameters nor prescribes a specific model for applicants as part of the MMPA incidental take authorization process. There is a level of variability not only with parameters in the models, but the uncertainty associated with data used in models and therefore the quality of the model results submitted by applicants. We, however, take all of this variability into consideration when evaluating applications. Applicants use models as a tool to evaluate potential impacts, estimate the number of takes of marine mammals, and for mitigation purposes. We take into consideration the model used and its results in determining the potential impacts to marine mammals; however, it is just one component of our analysis during the MMPA consultation process as we also take into consideration other factors associated with the proposed action, such as geographic location, duration of activities, context, intensity, etc. We consider takes generated by modeling as estimates, not absolutes, and we factor these into our analysis accordingly.

Comment 8: The Commission states that Lamont-Doherty applied scaling factors to empirical shallow-water zones based on modeled deep-water zones to account for tow depth differences. However, they are unsure why Lamont-Doherty would assume that the ratio of modeled zones in deep water would equate to empirical zones in shallow water, as those two quantities are not comparable.

Response: Lamont-Doherty's approach compares the sound exposure level (SEL) outputs between two different types of airgun configurations in deep water. This approach allows them to derive scaling relationships between the arrays and extrapolate empirical measurements or model outputs to different array sizes and tow depths. For example, if an Airgun Source A produces sound energy that is three times greater than Airgun Source B in deep water, it is reasonable to infer that the shallow-water mitigation zones for Airgun Source A would be three times larger than the shallow-water mitigation zones for Airgun Source B. Lamont-Doherty believes that this approach of



deriving scaling factors is a more rigorous approach to extrapolate existing empirical measurements for shallow water. Thus, this is the best available information to extrapolate the in situ shallow water measurements to array tow depths without field verification studies (Crone et al., 2013; Crone et. al., in press; Barton and Diebold, 2006).

Comment 9: The Commission seeks clarification on why Lamont-Doherty's estimated exclusion zone for the proposed survey (36-airgun array towed at 9 m in depth) is smaller than those previously authorized and the proposed buffer zone is larger than previously authorized (75 FR 44770; 76 FR 75525, 49737; 77 FR 25693, 41755). They also question why the estimated shallow-water exclusion zone for the mitigation airgun is smaller than previously authorized or proposed to be authorized (e.g., 77 FR 41755).

Response: We recognize the Commission's statement that the estimated exclusion zones are smaller and buffer zones are larger than under previous Authorizations and provide a detailed clarification of Lamont-Doherty's previous and current approaches in acoustic modeling in the notice of issuance of an Incidental Harassment Authorization to the USGS (79 FR 52121, September 2, 2014).

In summary, Lamont-Doherty's previous authorization applications and EAs for different airgun array configurations based their mitigation radii on the empirical results of Tolstoy et al. (2009) and adjusted for tow depth. For the deep-water site in the study, the hydrophone was at a depth of 350 to 500 m (1,148.3 to 1,640.4 ft) and only sampled received levels at a constant depth of 500 m (1,640.4 ft). Thus, the hydrophone did not sample the maximum received levels in the water column down to 2,000 m (6,561.7 ft). Due to this cutoff, one cannot use those predicted distances to the 160-, 180-, and 190-dB threshold contours as buffer and exclusion zones.

The previous documents use 160 dB root mean square (rms) from Tolstoy et al. (2009) and adjust for tow depth, and the current documents use the 150 dB sound exposure level (SEL) contour

from the Diebold et al. (2010) model, which accounts for the large difference in the 160-dB buffer zone (3,850 vs 5,780 m).

For the 190-dB exclusion zone, the differences between the previous rms versus the current SEL metrics are a significant factor. In Figures 7 and 8 of Tolstoy et al. (2009), there is not an exact 10-dB difference between SEL and 90% rms in the empirical data at short distances (200 to 500 m). In recent documents, Lamont-Doherty uses the Diebold et al., (2010) modeling approach. Here, they calculate the modeling results as SEL and then convert them to rms values using a fixed 10-dB difference. Using this approach, the distance to 190 dB rms (approximately 180 dB SEL) is less than what they previously obtained using rms values of the empirical measurements. However, the current approach does not underestimate the distance with respect to the trend of the SEL values of the empirical measurements obtained at the closest ranges shown in Figure 8 of Tolstoy et al. (2009) and also demonstrated in Figure 10 of Diebold et al. (2010).

The main reason for the significant fluctuations in modeling (dB discount with SEL value) is based on converting the values calculated as 90 percent rms and values obtained as SEL plus 10 dB. Table 1 compares Lamont-Doherty's previous (Tolstoy et al., 2009) and current (Tolstoy et al., 2009; Diebold et al., 2010) approach to acoustic propagation.

**Table 1** - Comparison of Lamont-Doherty's previous and current approach to acoustic propagation.

Categories	Previous Approach to Acoustic Propagation (Tolstoy <u>et al.</u> , 2009)	Current Approach to Acoustic Propagation (Tolstoy <u>et al.</u> , 2009 and Diebold <u>et al.</u> , 2010)
Model Approach	Ray trace of direct arrivals and source ghosts (reflection at the air-water interface at the array) from the array to the receivers.	Ray trace of direct arrivals and source ghosts (reflection at the air-water interface at the array) from the array to the receivers.
Model Assumptions	Constant velocity, infinite homogenous ocean layer, seafloor unbounded. Cross-line model more conservative than in-line model.	Constant velocity, infinite homogenous ocean layer, seafloor unbounded. Cross-line model more conservative than in-line model.
Propagation Measurements Analyzed	36 airguns (6,600 in <sup>3</sup> ), 6 m tow depth, 1,600 m (deep) 36 airguns (6,600 in <sup>3</sup> ), 6 m tow depth, 600 to 1,100 m (intermediate) 36 airguns (6,600 in <sup>3</sup> ), 6 m tow depth, 50 m (shallow)	36 airguns (6,600 in <sup>3</sup> ), 6 m tow depth, 50 m (shallow)

Receiver Specs	Calibration hydrophone buoy Shallow – spar buoy anchored on the seafloor, hydrophone at 18 m Intermediate – spar buoy not anchored, hydrophone at 18 m and 500 m Deep – spar buoy not anchored, hydrophone at 18 m and 350 to 500 m	Calibration hydrophone buoy and multi-channel seismic hydrophone array, both in shallow water.
Data Validation	Curve based on best fit line, 95% of received levels fall below curve	NA
Empirical Radii Appropriate for Sampling Maximum Received Level	36 airguns (shallow) – Yes, appropriate for mitigation modeling. 36 airguns (intermediate) – No, does not sample maximum received levels > 500 m. 36 airguns (deep) – No does not sample maximum received levels > 500 m.	36 airguns (shallow) – Yes, appropriate for mitigation radii.
Received Level Metric Presented	90% of cumulative energy rms levels and SEL Tolstoy et al. (2009) empirical data from Table 1.	SEL contours (150, 170, and 180) Diebold et al. (2010) modeled data from Figure 2.
RMS vs. SEL Offsets	36 airguns in deep water - ~14 dB offset, rms > SEL 36 airguns in shallow water – 8 dB offset, rms > SEL	NA
Differences between the Previous and Current Approaches	Because the deep-water calibration buoy only sampled received levels at a constant depth of 500 m, it is not appropriate to use the empirical deep-water data from Tolstoy et al. (2009) to derive mitigation radii. This is due to the buoy not capturing the intersect of all the SPL isopleths at their wildest point from the sea surface down to ~2,000 m. However, the received levels (i.e., direct arrivals and reflected and refracted arrivals) are in agreement with the current propagation model.	The current propagation model uses the maximum SPL values shown in Figure 2 in Diebold et al. (2010). These values along the diagonal maximum SPL line connect the points where the isopleths attain their maximum width (providing the maximum distance associated with each sound level). These distances will differ from values obtained along the Tolstoy et al. (2009) data shown in Table 1 which derives radii from the 500 m constant depth line.

Comment 10: The Commission notes that Lamont-Doherty (in cooperation with Pacific Gas and Electric Company) previously modeled sound propagation using site-specific parameters under various environmental conditions for a 2012 incidental harassment authorization application and associated environmental assessment for a geophysical survey of Diablo Canyon in California (77 FR 58256, September 19, 2012). The Commission agrees that we should not instruct applicants to use specific contractors or modeling packages, but that we should hold applicants to the same

standard as other applicants where they incorporate site and operation-specific environmental parameters into their models.

Response: See our response to Comment 7. On a broader note, we are currently pursuing methods that include site-specific components to allow us to better cross-check isopleth and propagation predictions submitted by applicants. Using this information, we could potentially recommend modifications to take estimates and/or mitigation zones, as appropriate.

Comment 11: The Commission notes that we increased the exclusion zone in shallow water by 3 dB for the proposed survey off North Carolina and for a recent survey recent survey off New Jersey (79 FR 38499). They question our use of the precautionary buffer if, we determined that Lamont-Doherty's model uses the best available science. They questioned why we did not extend the 160-dB buffer zone and re-estimate the number of take of marine mammals as well.

Response: For this survey, Lamont-Doherty developed the exclusion and buffer zones based on the conservative deep-water calibration results and empirically-derived shallow water exclusion zones from Diebold et al. (2010). Their current modeling approach represents the best available information to reach our determinations for the Authorization. As described earlier, the comparisons of Lamont-Doherty's model results and the field data collected in the Gulf of Mexico and Washington illustrate a degree of conservativeness built into their model for deep water, which we would expect to offset some of the limited ability of the model to capture the variability resulting from site-specific factors, especially in shallow water. However, in the interest of additional protection, we have required more conservative and precautionary mitigation and monitoring measures within this Authorization. We will require Lamont-Doherty to enlarge the 180-dB and 190-dB exclusion zones for all airgun array configurations in shallow water to further conservatively account for environmental variation within the survey area. The precautionary exclusion zone with the additional buffer would increase the radius of the exclusion zones in

shallow water by a factor of approximately 41 percent for the single airgun, approximately 48 percent for the 18-airgun array, and approximately 38 percent for the 36-airgun array. In light of those limitations and in consideration of the practicability of implementation, in this particular case, we recommended a more conservative approach to mitigation specifically tailored to the North Carolina seismic survey that required Lamont-Doherty to enlarge the exclusion zones. As noted previously, though there are limitations with the Lamont-Doherty model, we believe that Lamont-Doherty is able to adequately estimate take for this seismic survey. We have no reason to believe that potential variation in site-specific parameters would result in differences that would change our analysis of the general level or severity of effects or our necessary findings. However, in consideration of the practicability of doing so, we were able to add a precautionary buffer to the mitigation zone. For this Authorization, we will not require Lamont-Doherty to extend the 160-dB buffer zone or re-estimate the number of take of marine mammals for the reasons stated earlier.

Comment 12: The Commission notes that the Strategic Environmental Research and Development Program's (SERDP) spatial decision support system (SDSS) Marine Animal Model Mapper tool based on the U.S. Navy's OPAREA Density Estimates (NODE) model did not provide density estimates for spinner dolphins, Fraser's dolphins, melon-headed whales, pygmy killer whales, false killer whales, and killer whales. Because the potential for taking exists for these species, the Commission recommends that we authorize the taking of on at least the average group size to be consistent with the recent Authorization to the USGS for a seismic survey in the same general geographic area.

The Commission also recommended that we increase the proposed take authorized for the Northern North Carolina Estuarine stock and Southern North Carolina Estuarine stocks of bottlenose dolphins to account for average group size as well.

Response: We agree with the Commission's recommendations and determined that it is appropriate to include coverage for potential takes for those species based on group size. Table 4 in this notice includes the additional authorized take for those species.

For spinner dolphins, Fraser's dolphins, melon-headed whales, pygmy killer whales, false killer whales, and killer whales, we determined the mean group size based on data reported from the Cetacean and Turtle Assessment Program (CeTAP) surveys (CeTAP, 1982) and the Atlantic Marine Assessment Program for Protected Species (AMAPPS) surveys in 2010, 2011, 2012, and 2013 (NEFSC and SEFSC, 2011, 2012, 2013, 2014). For the Northern North Carolina Estuarine stock and Southern North Carolina Estuarine stocks of bottlenose dolphins, we determined the mean group size based on Read et al. (2003). Table 4 in this notice includes the additional authorized take for those species

Comment 13: The Commission discusses a potential seasonal haul-out site for harbor seals at Oregon Inlet, North Carolina and recommends that we determine the number of harbor seals that could potentially experience harassment incidental to the proposed survey and authorize that number in the final Authorization.

Response: The NMFS 2013 Stock Assessment Report notes that in recent years, small numbers of harbor seals (less than 50) have established winter haulout sites near Oregon Inlet, North Carolina. Other anecdotal sources have identified the haulout site as Green Island Slough on the south side of Oregon Inlet (Star News Online, 2012) and counted as many as 30 harbor seals hauled out at this location which is within Pamlico Sound and not within the proposed survey area.

We agree with the Commission's recommendation and determined that it is appropriate to include coverage for potential takes for harbor seals based upon group size data reported in the AMAPPS 2013 survey (NEFSC and SEFSC, 2014). Table 4 in this notice includes the additional

authorized take for harbor seals that could potentially experience harassment incidental to the proposed survey.

Comment 14: The Commission understands the Lamont-Doherty would survey the OBS tracklines twice, once for acquiring OBS data and once for recording source shots with the MCS. Because Lamont-Doherty did not estimate the ensonified area based on repeating the OBS tracklines, the Commission recommends that we require Lamont-Doherty to re-estimate the total numbers of takes based on surveying the OBS portion two times and base our “small numbers” and “negligible impact” determinations on those revised take estimates.

Response: Lamont-Doherty modeled the number of individuals that could be exposed to airgun sounds with received levels greater than or equal to 160 dB re: 1  $\mu$ Pa on one or more occasions by multiplying the total marine area that would be within the 160-dB radius around the operating seismic source on at least one occasion (40,968 km<sup>2</sup>) along with the expected density of animals in the area. However, as the Commission noted, this approach does not account for Lamont-Doherty acquiring data for the ocean bottom seismometer (OBS) portion of the survey tracklines which includes two instances of ensonification (i.e., one pass for acquiring OBS data and a second pass for recording source shots with the multi-channel seismic (MCS). On average, for a 400-km line segment, the Langseth traveling at 8.3 km /hour would take approximately 4 days to complete the acquisition. In total, there are 10 tracklines that would require repeat coverage (see Figure 1 in this notice, Lines 1 through 4b).

Lamont-Doherty estimated the ratio of the ensonified area including overlap (63,367 km<sup>2</sup>) and the ensonified area excluding overlap (40,968 km<sup>2</sup>) to be 1.54. Using this ratio, we can obtain an approximation of the number of possible exposures (including repeated exposures of the same individuals).

In considering the likelihood of re-exposure of certain individuals during the survey, the Authorization would include additional coverage for those potential takes of individuals where Lamont-Doherty would repeat those tracklines. However, we expect that most individuals would experience at most a single exposure to the 160 dB re: 1  $\mu\text{Pa}_{\text{rms}}$  level or higher due to required mitigation and monitoring measures and it is unlikely that a particular animal would remain in the area during the entire survey (Bain and Williams, 2006; MacLeod et al., 2006; McCauley et al., 2000; McDonald et al., 1995).

Because the area including overlap is 1.54 times greater than the area excluding overlap, we estimated instances of exposures when the tracklines overlapped by multiplying the original take estimate by 0.54, which provides the number of instances of exposures above 160 dB. We then multiplied the number of exposure instances by a generalized turnover estimate of 25 percent (Wood et al., 2012) to account for take of additional individuals that could experience Level B harassment within those areas where the tracklines overlap.

We recognize that turnover within the project area would not approach 100 percent per day and that a method that assumes 100% turnover would far overestimate the number of individual marine mammals exposed above the 160 dB re: 1  $\mu\text{Pa}$  threshold. We expect that use of a generalized factor of 25 percent would provide a more reasonable estimate of the number of new animals exposed when the Langseth repeats tracklines, and then we are assuming that the rest of the instances of take in the repeated tracklines are repeat exposures to previously exposed animals. The explanation for our small numbers and negligible impact determinations based on these revised take estimates for individuals is in the Analysis and Determinations section.

Comment 15: NRDC et al. states that Lamont-Doherty provides no justification for the particular trackline configuration (see Addendum) and why that design elected to remove the 25 percent contingency that it typically adds to its tracklines, as opposed to other potential designs



represents the least practical adverse impact on marine mammals. They further state that we should limit Lamont-Doherty to both the specified tracklines and the specified number of line-kilometers, and require cessation of the activity when they reach the latter.

Response: See our response to Comment 14. For this survey, Lamont-Doherty assumes that the Langseth will not need to repeat some tracklines, accommodate the turning of the vessel, address equipment malfunctions, or conduct equipment testing to complete the survey. Lamont-Doherty added a 25 percent contingency allowance in their application and draft EA to their ensonified area calculations for additional seismic operations in the survey area associated with infill of missing data, and/or repeat coverage of any areas where initial data quality was sub-standard; however, they have eliminated the contingency from their final calculations. Whereas Lamont-Doherty added this 25 percent contingency to some past seismic surveys, for this particular survey design, the additional contingency was not necessary and removed from the final calculations for the proposed activities. Thus, total tracklines for the proposed survey would not exceed 5,320 km.

We have revised the take estimates to account for the 10 tracklines that would require repeat coverage. The Authorization accounts for the modified number of tracklines (including repeated tracklines) shown in Figure 1 in this notice. We note that unlike previous seismic surveys aboard the Langseth, Lamont-Doherty would conduct the 2-D survey as almost one continuous line. Therefore, the ensonified area for the seismic survey does not include a contingency factor (typically increased by 25 percent to accommodate turns and equipment testing, etc.) in line-kilometers. Also, any marine mammal sightings within or near the designated exclusion zones will result in a power-down and/or shut-down of seismic operations as a mitigation measure effecting the least practicable adverse impact on marine mammals.

Comment 16: NRDC et al. state that NMFS made erroneous small numbers and negligible impact determinations.

Response: We are required to authorize the take of “small numbers” of a species or stock if the taking by harassment will have a negligible impact on the affected species or stocks and will not have an unmitigable adverse impact on the availability of such species or stock for taking for subsistence purposes. See 16 U.S.C. 1371(a)(5)(D). In determining whether to authorize “small numbers” of a species or stock, NMFS determines whether the taking will be small relative to the estimated population size and relevant to the behavior, physiology, and life history of the species or stock.

With the exception of sei whales and pantropical spotted dolphins, less than 12 percent of each species stock or population would be taken by harassment. With respect to the type of take, we are authorizing only Level B behavioral harassment and do not anticipate any injury or mortality. Although modeling results indicate that up to 27% of the sei whale population and 24% of the pantropical spotted dolphin population could potentially be exposed to received sound levels  $\geq 160$  dB re 1  $\mu$ Pa, we determined that takes resulting from Lamont-Doherty’s activities will constitute only a “small number,” especially considering that the modeling results do not take into account the implementation of mitigation measures, which would likely further lower the number of animals taken even further.

We discuss our rationale for our negligible impact finding in the Analysis and Determinations section.

Comment 17: Dr. Pabst stated that within the study area, beaked whales have a non-random distribution that is exclusively along the deep continental shelf edge and beyond the shelf. She suggests that beaked whales may not be able to move away from the sound source due to their geographically-specific distribution patterns.

Response: We recognize the acoustic sensitivity of beaked whales to anthropogenic sounds; however, studies on long-term or large-scale displacement of disturbed cetaceans are limited (McSweeney et al., 2007; Schorr et al., 2014).

The Schorr et al. (2014) paper discusses site fidelity of Cuvier's beaked whales within the Southern California Anti-submarine Warfare Range (SOAR). They note that despite the high level of acoustic disturbance from naval exercises present within the area, displacement of the population of Cuvier's beaked whales appeared temporary (Schorr et al., 2014). They also discuss that the prolonged and recurrent use of the area by that particular population of whales suggests that Ziphius in this region have likely adapted to life with a certain amount of acoustic disturbance and that local advantages (i.e., foraging) may outweigh the costs it imposes.

Our discussion of avoidance behaviors in the notice of proposed authorization (79 FR 44549, July 31, 2014) supports our expectations that individuals will avoid exposure at higher levels. Also, it is unlikely that animals would encounter repeated exposures at very close distances to the sound source because Lamont-Doherty would implement the required shutdown and power down mitigation measures to ensure that marine mammals do not approach the applicable exclusion zones for Level A harassment. We anticipate only behavioral disturbance to occur primarily in the form of avoidance behavior to the sound source during the conduct of the survey activities.

Comment 18: Dr. Pabst stated that she was uncertain as to how we determined the stock abundances for beaked whales in Table 1 of the notice of proposed Authorization because the stock abundance estimate of 7,092 for Mesoplodon spp. does not represent the true abundance of any one species. She also noted that the best estimate for Cuvier's beaked whale (Z. cavirostris) is 6,532 individuals not 7,092.

Response: We obtained stock abundances for Mesoplodon spp. from the U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessment Report (SAR) – 2013. The SAR includes a

description of the stock, including its geographic range and a minimum population estimate. In the case of the three Mesoplodon species identified in the proposed notice of Authorization (Blainville's, Gervais', and True's), the 2013 SAR notes that the abundance estimate for each species includes an aggregate of abundance estimates for Gervais' beaked whales and Blainville's beaked whales in the Gulf of Mexico and all species of Mesoplodon in the Atlantic. We acknowledge that the estimate of 7,092 does not represent the true abundance of any one species of Mesoplodon; however this represents the best available information for each species to make our determinations under section 101(a)(5)(A) of the MMPA. Regarding the best estimate for Cuvier's beaked whale, we have corrected the estimate in this notice to 6,532 individuals.

#### Mitigation

Comment 19: The Commission states that for some deep-diving cetaceans, the proposed 30-minute clearance time may be inadequate (e.g., Schorr et al., 2014). Because beaked and sperm whales, in particular, can remain submerged for periods far exceeding 30 minutes, they recommend that we require a 60-minute clearance time for deep-diving species, after either a power down or shutdown of the airgun array, if an observer does not see an animal depart the exclusion zone.

Response: For this survey, the Foundation has informed us that they would increase the clearance time after a shutdown or power-down for deep-diving species such as beaked whales and sperm whales from 30 minutes to 60 minutes.

For a shutdown in this particular survey, the Authorization requires the Langseth to turn off the airgun(s) if a visual observer detects a marine mammal within, approaching, or entering the relevant exclusion zone for Level A harassment. For this Authorization, if that particular species is either a beaked whale or sperm whale, the observer must visually confirm that the animal has departed the relevant exclusion zone before restarting the airgun array. If the observer does not see the beaked

whale or sperm whale depart the exclusion zone, the Langseth cannot ramp-up the airguns until 60 minutes has passed from the last sighting of the beaked whale or sperm whale.

For a power down in this particular survey, the Authorization requires the Langseth to decrease the number of airguns in use such that the radius of the exclusion zone is smaller to the extent that marine mammals are no longer within or about to enter the exclusion zone. For this Authorization, if that particular species is either a beaked whale or sperm whale, the observer must visually confirm that the animal has departed the relevant exclusion zone before restarting the airgun array. If the observer does not see the beaked whale or sperm whale depart the exclusion zone, the Langseth cannot resume operations at full power until 60 minutes has passed from the last sighting of the beaked whale or sperm whale.

We also considered the Schorr et al. (2014) study which used satellite-linked tags to record the diving behavior and locations of eight Cuvier's beaked whales within Southern California Anti-submarine Warfare Range (SOAR) from 2010 to 2012 for periods up to three months. The authors collected over 3,000 hours of dive data with associated regional movements within the study area. In total, tagged whales performed 1,142 deep dives to a group mean depth of 1,401 m (4,596 ft); group mean dive duration of 67.4 minutes; and group mean surfacing bouts that separated back-to-back deep dives of 35.7 minutes. The authors note that the SOAR represents important habitat for the whales despite the high level of acoustic disturbance present within the area. However, they note that given the acoustic sensitivity of beaked whales and other odontocetes, it is likely that sonar use occasionally displaces the whales, but that the level of displacement in this population appeared to be temporary (Schorr et al., 2014). These data better characterize the true behavioral range of this species; however, the authors suggest exercising caution when drawing conclusions about behavior using these short-term tagging records (Schorr et al., 2014).

Comment 20: Dr. Pabst and Mr. McLellan also expressed concern about the proposed seismic survey's effect on beaked whales within the study area. Both noted that the survey lines would occur in areas of high beaked whale abundance due to high numbers of beaked whale sightings and suggest that 30 minutes may not be sufficient for protected species observers to monitor beaked whales within the exclusion zone after a shutdown because of the species' extended diving capability and prolonged breath hold.

Response: See our response to Comment 19.

Comment 21: NRDC et al. states that time and area restrictions designed to protect high-value habitat are one of the most effective means to reduce the potential impacts of noise and disturbance. Commenters state that the proposed Authorization does not consider any areas for seasonal planning, trackline avoidance, or closure for any species other than North Atlantic right whales. They also discuss the Cape Hatteras Special Research Area (CHSRA) as crucial habitat for short- and long-finned pilot whales and Risso's dolphins.

Response: We disagree with NRDC et al.'s assessment. Regarding seasonal planning, we note that the Foundation's EA considered potential times to carry out the survey taking into consideration key factors such as environmental conditions and species presence. The Authorization's required mitigation measures already require shut-downs and/or power-downs for species of special concern. Considering the rarity and conservation status for the North Atlantic right whale, Lamont-Doherty will shut down the airguns immediately in the unlikely event that observers see this species, regardless of the distance from the Langseth. The airgun array shall not resume firing (with ramp-up) until 30 minutes after the last documented North Atlantic right whale visual sighting. Also, we expect that the North Atlantic right whale would be farther north at the time of the survey, so the current timing of the survey represents the least practical adverse impact for this species. Additionally, the mitigation measures state that concentrations of humpback, sei,

fin, blue, and/or sperm whales will be avoided if possible (i.e., exposing concentrations of animals to 160 dB), and that Lamont-Doherty will power-down the array if necessary. For purposes of this planned survey, a concentration or group of whales will consist of six or more individuals visually sighted that do not appear to be traveling (e.g., feeding, socializing, etc.).

Concerning the avoidance of marine mammals through the modification of tracklines, the Authorization states that the Langseth should alter speed or course during seismic operation if a marine mammal, based on its position and relative motion, appears likely to enter the relevant exclusion zone. If speed or course alteration is not safe or practicable, or if after alteration the marine mammal still appears likely to enter the exclusion zone, further mitigation measures, such as a power-down or shut-down, shall be taken.

The CHSRA is a special research area offshore of Cape Hatteras, North Carolina designated by NMFS under the Pelagic Longline Take Reduction Plan. The research conducted within the CHSRS results in a better understanding the nature of marine mammal interactions incidental to the commercial pelagic longline fishery. The goal is to reduce serious injuries and mortalities of pilot whales and Risso's dolphins resulting from interactions with pelagic longline gear. The CHSRA designation relates specifically to commercial longline fishing and regulatory and non-regulatory measures to reduce marine mammal and other species bycatch from that fishery. It does not, however, include restrictions on other activities including navigation through the area and, therefore, would not warrant a year-round area closure for other activities including seismic survey research activities. Thus, the research requirements for the CHSRA do not apply to Lamont-Doherty's planned survey because we categorize their activity as a non-commercial fishing activity under the MMPA.

The seismic survey's planned tracklines—designed for the specific objectives of this survey, combined with the transiting vessel and airgun array, make avoiding this particular area impractical

and likely would not provide significant reduction in potential impacts from underwater sound or sufficient conservation benefits for this specific project. However, the Foundation's EA considers that slight track adjustments are possible to avoid fisheries conflicts: "...conflicts would be avoided through communication with the fishing community during the survey and publication of a Notice to Mariners about operations in the area. A chase boat would also be employed to assist the Langseth..."

Comment 22: NRDC et al. state that we should conduct a habitat mapping analysis to determine a time-area restrictions within the study area. Researchers have developed at least two predictive models to characterize densities of marine mammals in the area of interest: the NODE model produced by the Naval Facilities Engineering Command Atlantic and the Duke Marine Lab model produced under contract with the Strategic Environmental Research and Development Program. Until Duke has produced its new cetacean density model, pursuant to NOAA's CetMap program, NRDC et al. state that we should use these sources, which represent best available science to identify important marine mammal habitat and ensure the least practicable impact for species of concern.

Response: NMFS used the Navy's NODE model for determining the density data of marine mammal species (where it was available) and calculating estimated take numbers. We were not able to identify any other important habitat areas of specific importance to marine mammals from this dataset that are appropriate for avoidance or time-area restrictions. As stated earlier, the seismic survey's planned tracklines, designed for the specific objectives of this survey, combined with the transiting vessel and airgun array, make time-area restrictions and avoiding specific habitat areas impractical and likely would not provide significant reduction in potential impacts from underwater sound or sufficient conservation benefits for this specific project.



Comment 23: NRDC et al. state that we should require that the airgun survey vessel use the lowest practicable source level, minimize horizontal propagation of the sound signal, and minimize the density of tracklines consistent with the purposes of the survey. NRDC et al. state that while Lamont-Doherty gives cursory consideration for the source level, there is little explanation of the conclusion that Lamont-Doherty requires a 36-airgun array. NRDC et al. would note that for a 2013 study off Spain, Lamont-Doherty used two 18-airgun arrays operating in ping-pong mode rather than a single, high-source-level, 36-gun array.

Response: We encourage all seismic surveys using airguns as a sound source to use the lowest practicable source level to achieve the purposes of the action. In order to fulfill the purpose of the seismic survey, however, Lamont-Doherty's seismic survey requires the use of both the 18-airgun and 36-airgun array configurations. The Principal Investigators (PIs) have proposed to use the full array (6,600 in<sup>3</sup>) on the five marine seismic lines where ocean-bottom seismometers would exist (Figure 1 of IHA application) because the geological targets beneath these profiles are deep (up to 40 km beneath the seafloor) structures in the crust and upper mantle will provide essential information on the opening of the Atlantic Ocean. The PIs determined that, based on their experience, using the full array on these lines is necessary to ensure the quality of data collection at the target depths for the OBS and MCS tracklines and thus to meet the primary goal of this research program. The remaining MCS-only lines are primarily targeting sediments and rocks in the upper/middle part of the crust, so a smaller array (3,300 in<sup>3</sup>) is adequate for these profiles. As stated previously, we have considered this rationale and Lamont-Doherty's reasons for why the measure may (or may not) be practicable. After taking into consideration the project's purpose, we agree with Lamont-Doherty that there is no practicable alternative for Lamont-Doherty's proposed use of the 36-airgun array for OBS tracklines.

Regarding the comment about minimizing horizontal propagation of the sound signal, the

configuration of the airgun array, causes the signals to constructively interfere in the vertical direction and destructively interfere in horizontal direction. This is evident in the elliptical shape of the modeled received signals presented in the Foundation's EA.

Comment 24: NRDC et al. states that we should require Lamont-Doherty to use an alternative to the multi-beam echosounder to the one presently proposed.

Response: We disagree with NRDC et al.'s recommendation as we do not have the authority to require the incidental take authorization applicant or action proponent to choose a different multi-beam echosounder system for the planned seismic survey. The multi-beam echosounder system currently installed on the Langseth is capable of mapping the seafloor in deep water and the characteristics of the system are well suited for meeting the research goals at the action area. It would not be practicable for the Lamont-Doherty and the Foundation to install a different multi-beam echosounder for the planned seismic survey. NRDC et al. did not recommend a specific multi-beam echosounder to use as an alternative to the one currently installed on the vessel and planned for operation during the seismic survey. The multi-beam echosounder that is currently installed on the Langseth was evaluated in the NSF/USGS PEIS and in the Foundation's EA, and has been used on over 25 research seismic surveys since 2008 without association to any marine mammal strandings.

Regarding the 2002 stranding in the Gulf of California, the multi-beam echosounder system was on a different vessel, the R/V Maurice Ewing (Ewing), which Lamont-Doherty no longer operates. Although NRDC et al. suggests that the multi-beam echosounder system or other acoustic sources on the Ewing may have been associated with the 2002 stranding of two beaked whales, as noted in Cox et al. (2006), "whether or not this survey caused the beaked whales to strand has been a matter of debate because of the small number of animals involved and a lack of knowledge regarding the temporal and spatial correlation between the animals and the sound source." As noted by Yoder

(2002), there was no scientific linkage to the event with the Ewing's activities and the acoustic sources used. Furthermore, Hildebrand (2006) has noted that "the settings for these stranding are strikingly consistent: an island or archipelago with deep water nearby, appropriate for beaked whale foraging habitat. The conditions for mass stranding may be optimized when the sound source transits a deep channel between two islands, such as in the Bahamas, and apparently in the Madeira incident." The activities planned for the seismic survey do not relate to the environmental scenarios noted by Hildebrand (2006).

Regarding the 2008 stranding event in Madagascar and the Final Report of the Independent Scientific Review Panel (ISRP) cited to by NRDC et al., we considered this report in the notice of proposed Authorization. The multi-beam in use on this seismic survey is not operating in the same way as it was in Madagascar. The Authorization requires Lamont-Doherty to plan to conduct the seismic surveys (especially when near land) from the coast (inshore) and proceed towards the sea (offshore) in order to avoid the potential herding "herding of sensitive species" into canyons and other similar areas. Given these conditions, NMFS does not anticipate mass strandings from use of the planned multi-beam echosounder.

Comment 25: NRDC et al. states that the proposed Authorization does not adequately consider, or fails to consider at all, sound source validation. NRDC et al. states that we should require Lamont-Doherty and the Foundation to validate the assumptions about propagation distances used to establish exclusion and buffer zones and calculate take (i.e., at minimum, the 160 dB and 180 dB isopleths). Sound source validation has been required of Arctic operators for several years, as part of their incidental take authorization compliance requirements, and has proven useful for establishing more accurate, in situ measurements of exclusion zones and for acquiring information on noise propagation.

Response: NMFS disagrees with NRDC et al.'s assessment that we did not adequately consider or require a sound source validation. Regarding concerns about validating the assumptions about propagation distances used to establish buffer and exclusion zones and calculated take, measuring sound source isopleths requires specialized sensors that are either self-contained buoys (such as those used by Tolstoy et al., 2009), at the seafloor (such as those used by Thode et al., 2010), or deployed from a second ship, such as those used by Mosher et al., 2009). Experiments with these instruments are non-trivial experiments in deep water and generally take several days of ship time (or two vessels) in order to establish shooting patterns, appropriate gain settings, and deployment/recovery of the instruments. Lamont-Doherty has demonstrated that in deep water, the propagation paths are simple and that the sound propagation models are conservative, i.e., they overestimate the distances to the Level A and B harassment isopleths (as demonstrated in Figures 11, 12 and 16 in the NSF/USGS PEIS Appendix H). Consequently, using the model parameters is a precautionary approach that saves considerable time and expense in conducting the seismic survey.

For shallow-water surveys see our response to Comment 6. We are currently pursuing methods that include site-specific components to allow us to better cross-check isopleth and propagation predictions submitted by applicants. Using this information, we could potentially recommend modifications to mitigation zones, as appropriate.

Comment 26: NRDC et al. state that we should reconsider the size (distance) of the safety zone. The proposed Authorization proposes establishing a safety zone of 180 dB re 1  $\mu$ Pa (with a 500 m minimum around the airgun array). Gedamke et al. (2011) has put traditional means of estimating safety zones in doubt. NRDC et al. state that we should consider establishing an exclusion zone for shut-downs for certain target species. Although time/area closures are a more effective means of reducing cumulative exposures of wildlife to disruptive and harmful sound, expanded exclusion zones have value minimizing disruptions, and potentially in reducing the risk of hearing loss and

injury, outside the seasonal closure areas. Visual sighting of any individual North Atlantic right whale at any distance should trigger a shut-down; for other species, shut-downs should occur if aggregations are observed within the 160 dB isopleth around the sound source.

Response: We disagree with NRDC et al.'s recommendation that we should reconsider the size (distance) of the exclusion zone. We note that the statement that the proposed Authorization proposes establishing a safety zone of 180 dB re: 1  $\mu$ Pa (with a 500 m minimum around the airgun array) is incorrect. NRDC et al. may be referring to BOEM/BSEE Joint NTL No. 2012-G02 (available online at: <http://www.boem.gov/Regulations/Notices-To-Lessees/2012/2012-JOINT-G02-pdf.aspx>), which requires an immediate shut-down of the airgun operations "within an estimated 500 m of the sound source array." The 180-dB exclusion zones for Lamont-Doherty's planned survey are:

- 18-Airguns: 1,628 m in shallow water; 675 m in intermediate depths; and 450 m in deep water.
- 36-Airguns: 2,838 in shallow water; 1,391 in in intermediate depths; and 927 m in deep water.

As discussed earlier in Comment 20, the Authorization includes mitigation measures that require shut-downs and/or power-downs for species of special concern including North Atlantic right whales and concentrations of humpback, sei, fin, blue, and/or sperm whales.

Comment 27: NRDC et al. state that real-time monitoring effort in the proposed Authorization is inadequate. NRDC et al. states that supplemental methods used on certain other projects include hydrophone buoys and other platforms for acoustic monitoring, aerial surveys, shore-based monitoring, and the use of additional small vessels.

Response: We have not included hydrophone buoys for acoustic monitoring, aerial surveys, shore-based monitoring, or the use of additional small/support vessels in the Authorization as they

are not practicable for Lamont-Doherty's seismic survey. In certain situations, we have recommended the use of additional support vessels to enhance protected species observer monitoring effort during seismic surveys. For this seismic survey, however, we have not deemed it necessary to employ additional support vessels to monitor the buffer and exclusion zones due to the relatively small distances of the exclusion zones. Finally, the Langseth has limited maneuverability during airgun operations and cannot deploy or recover small vessels for activities such as hydrophone acoustic monitoring.

Comment 28: NRDC et al. states that the requirements with respect to protected species observers are inconsistent with survey conventions and with prior studies of observer effectiveness. NRDC et al. state four hour work cycles are not appropriate and comment that we offer no details about the training requirements of its vessel-based observers.

Response: The general duties of protected species observers required for seismic surveys are to visually observe the immediate environment for protected species whose detection (relative to a sound source) triggers the implementation of mitigation requirements, monitoring compliance with mitigation requirements, collecting data by defined protocols, preparing daily reports, and submitting reports to us. During seismic operations, at least five observers (four visual observers and one acoustic observer) are based aboard the Langseth. Lamont-Doherty will appoint the observers with our concurrence. The observers aboard the Langseth are professional and experienced observers provided to Lamont-Doherty under contract to RPS and have been in place during seismic surveys since 2008. The protected species observers and PAM operators complete in-house training. These candidates must pass a protected species identification test and a mitigation and monitoring practices exam with a minimum grade of 80%. The RPS training program includes, but is not limited to: background on protected species laws in the U.S. and worldwide, an introduction to seismic surveys (purpose, types, and equipment), potential impacts of underwater

sound on protected species, protected species in the Gulf of Mexico and other regions, visual monitoring methods, acoustic monitoring methods, protected species detection in the field, implementation of mitigation measures (exclusion and buffer zones, ramp-ups, power-downs, shut-downs, delays, etc.), and data collection and report preparation. In November 2013, NMFS prepared and published, with input from BOEM and BSEE, a technical memorandum (tech memo) titled “National Standards for a Protected Species Observer and Data Management Program: A Model Using Geological and Geophysical Surveys” (Baker *et al.*, 2013) that makes recommendations on establishing a training program, PSO eligibility and qualifications, as well as PSO evaluation during permit/authorization approval. The tech memo is available online at: [http://www.nmfs.noaa.gov/pr/publications/techmemo/observers\\_nmfsopr49.pdf](http://www.nmfs.noaa.gov/pr/publications/techmemo/observers_nmfsopr49.pdf). Our current practice is to deem protected species observer candidates as NMFS-approved or qualified on a case-by-case or project-by-project basis after review of their resume and/or curriculum vitae. Lamont-Doherty’s protected species observers have the necessary education and/or experience requirements and their training generally follows the standard components recommended in NMFS’s tech memo.

Observations will take place during ongoing daytime operations and nighttime ramp-ups of the airguns. During the majority of seismic operations, two visual observers will be on duty from the observation tower (i.e., the best available vantage point on the source vessel) to monitor marine mammals near the seismic vessel. Use of two simultaneous visual observers will increase the effectiveness of detecting animals near the source vessel. However, during meal times and bathroom breaks, it is sometimes difficult to have two observers on effort, but at least one observer will be on duty. Regarding the comment about four-hour work shifts, the Authorization states that protected species observer shifts shall not exceed four hours, allowing shifts to be shorter. The observers will rotate through visual watch and the PAM station (see next response) with breaks in between to avoid fatigue and increase the detection of marine mammals present in the area.

The NSF/USGS PEIS identifies PAM as an important tool to augment visual observations (section 2.4.2). As described in the Foundation's EA, the observer would monitor PAM continuously during seismic operations. The Authorization requires that an expert bioacoustician design and set up the PAM system, oversee the PAM, and assist the other observers when technical issues occur during the survey. He/she will monitor the PAM system at all times, in shifts no longer than six hours, with the observers sharing the workload. Hence, observers will rotate through visual watch and the PAM station with breaks in between to avoid fatigue and increase the detection of marine mammals present in the area.

Comment 29: NRDC et al. state that the proposed Authorization makes no consideration of limiting activities in low-visibility conditions or at night.

Response: We disagree with the commenters' assessment. The Authorization does consider and address airgun operations during low-visibility and nighttime conditions. No initiation of airgun array operations is permitted from a shut-down position at night or during low-light hours (such as in dense fog or heavy rain) when the entire relevant exclusion zone cannot be effectively monitored by the visual observers on duty. However, survey operations may continue into night and low-light hours if the segment(s) of the survey begins when the entire relevant exclusion zones are visible and the observers can effectively monitor them. Limiting or suspending the seismic survey in low visibility conditions or at night would significantly extend the duration of the seismic survey.

Comment 30: NRDC et al. states that we should consider technology-based mitigation.

Response: While we encourage the development of new or alternative technologies to reduce potential impacts to marine mammals from underwater sound, we did not include a requirement in the Authorization to use or test the use of new technologies during Lamont-Doherty's seismic survey as none are currently available or proposed for use by Lamont-Doherty. The NSF/USGS PEIS (Section 2.6), considered alternative technologies to airguns but eliminated those options from



further analysis as those technologies were not commercially viable. Lamont-Doherty and the Foundation continue to closely monitor the development and progress of these types of systems; however, at this point and time, these systems are still not commercially available.

Geo-Kinetics, mentioned by NRDC et al. as a potentially viable option for marine vibroseis does not have a viable towable array and its current testing is limited to transition zone settings. Other possible vibroseis developments lack even prototypes to test. Similarly, industry is currently developing engineering enhancements to airguns to reduce high frequencies, however, at present; these airguns are still not commercially available. Lamont-Doherty has maintained contact and is in communication with a number of developers and companies to express a willingness to serve as a test-bed for any such new technologies. As noted in the NSF/USGS PEIS, should new technologies to conduct marine seismic surveys become available, USGS and NSF would consider whether they would be effective tools to meet research goals (and assess any potential environmental impacts).

Of the various technologies cited in the 2009 Okeanos workshop report, few if any have reached operational viability. While the marine vibrator technology has been long discussed and evaluated, the technology is still unrealized commercially. According to Pramik (2013), the leading development effort by the Joint Industry Programme “has the goal of developing three competing designs within the next few years.” Geo-Kinetics has recently announced a commercial product called AquaVib, but that product produces relatively low-power, and is intended for use in very shallow water depths in sensitive environments and the vicinity of pipelines or other infrastructure. The instrument is entirely unsuited to deep-water, long-offset reflection profiling. The BP North America staggered burst technique would need development well beyond the patent stage to be remotely practicable and would require extensive modification and testing of the Langseth sound source and recording systems. None of the other technologies considered (i.e., gravity, electromagnetic, Deep Towed Acoustics/Geophysics System developed by the U.S. Navy

[DTAGS], etc.) can produce the resolution or sub-seafloor penetration required to resolve sediment thickness and geologic structure at the requisite scales. Improving the streamer signal to noise through improved telemetry (e.g., fiber optic cable) while desirable, would involve replacing the Langseth streamers and acquisition units, requiring a major capital expenditure.

#### Acoustic Thresholds

Comment 31: NRDC et al. state that the current 160-dB threshold for Level B harassment does not reflect the best available science and is not sufficiently conservative. NRDC et al. state that our use of a single, non-conservative, bright-line threshold for all species is contrary to recent science and is untenable. They add the 160 dB threshold is non-conservative, since the scientific literature establishes that behavioral disruption can occur at substantially lower received levels for some species. Finally, they state that we should employ a combination of specific thresholds for which sufficient species-specific data are available and generalized thresholds for all other species.

Response: Our practice has been to apply the 160 dB received level threshold for underwater impulse sound levels to determine whether take by Level B harassment occurs. Specifically, we derived the 160 dB threshold data from mother-calf pairs of migrating gray whales (Malme et al., 1983, 1984) and bowhead whales (Richardson et al., 1985, 1986) responding to airgun operations. We acknowledge that there is more recent information bearing on behavioral reactions to seismic airguns, but those data only illustrate how complex and context-dependent the relationship is between the two, and do not, as a whole, invalidate the current threshold. Accordingly, it is not a matter of merely replacing the existing threshold with a new one. We discussed the science on this issue qualitatively in our analysis of potential effects to marine mammals in the Federal Register notice for the proposed Authorization (79 FR 44549, July 31, 2014) and we are currently developing revised acoustic guidelines for assessing the effects of anthropogenic sound on marine mammals. Until we finalize these guidelines (a process that includes internal agency review, public notice and

comment, and peer review), we will continue to rely on the existing criteria for Level A and Level B harassment shutdown of the notice for the proposed Authorization (79 FR page 44572, July 31, 2014).

As mentioned in the Federal Register notice for the proposed IHA (79 FR 44549, July 31, 2014), we expect that the onset for behavioral harassment is largely context dependent (e.g., behavioral state of the animals, distance from the sound source, etc.) when evaluating behavioral responses of marine mammals to acoustic sources. Although using a uniform sound pressure level of 160 dB for the onset of behavioral harassment for impulse noises may not capture all of the nuances of different marine mammal reactions to sound, it is an appropriate way to manage and regulate anthropogenic noise impacts on marine mammals until we finalize the acoustic guidelines.

Comment 32: NRDC et al. states that we failed to analyze masking effects or set thresholds for masking.

Response: Exposure to seismic sources has been shown to have impacts on marine mammal vocalizations with sometimes animals vocalizing more (e.g., Di Iorio and Clark, 2009) in the presence of these sources and sometimes less (e.g., Blackwell et al., 2013). Additionally, many species have short-term and long-term means of dealing with masking. However, the energetic consequences of these adaptations are unknown. Recent published models have allowed the ability to better quantify the effects of masking on baleen whales for certain underwater sound sources, like shipping (e.g., change in communication space; Clark et al., 2009; Hatch et al., 2012). However, models for other sources have not been published. The notice of the proposed IHA (79 FR 44549, July 31, 2014) described the potential effects of the seismic survey on marine mammals, including masking. In general, we expect the masking effects of airgun pulses to be minor, given the normally intermittent nature of the pulses and the fact that the acoustic footprint of the survey is only expected to overlay a low number of low-frequency hearing specialists and is not in any specifically

identified biologically important areas.

Comment 33: NRDC et al. assert that our preliminary determinations for Level A take and the likelihood of temporary and or permanent threshold shift do not consider the best available science. NRDC cites several papers, including Lucke et al. (2009); Thompson et al. (1998); Kastak et al. (2008); Kujawa and Lieberman (2009); Wood et al. (2012); and Cox et al. (2006) for our consideration.

Response: We have, in making our determinations, considered the best available science. As explained in the notice of the proposed IHA (79 FR 44549, July 31, 2014), we will require Lamont-Doherty to establish exclusion zones for marine mammals before operating the airgun array. We expect that the required vessel-based visual monitoring of the exclusion zones is appropriate to implement mitigation measures to prevent Level A harassment. First, if the protected species observers see marine mammals approaching the exclusion zone, Lamont-Doherty must shut-down or power-down seismic operations to ensure that the marine mammal does not approach the applicable exclusion radius. Second, if Lamont-Doherty detects a marine mammal outside the exclusion zone, and the animal, based on its position and the relative motion, is likely to enter the exclusion zone, Lamont-Doherty may alter the vessel's speed and/or course, when practical and safe, in combination with powering-down or shutting-down the airguns, to minimize the effects of the seismic survey. The avoidance behaviors discussed in the notice of the proposed IHA (79 FR 44549, July 31, 2014) support our expectations that individuals will avoid exposure at higher levels. Also, it is unlikely that animals would encounter repeated exposures at very close distances to the sound source because Lamont-Doherty would implement the required shut-down and power-down mitigation measures to ensure that marine mammals do not approach the applicable exclusion zones for Level A harassment.

Our current Level A thresholds, which identify levels above which PTS could be incurred, were

designed to be precautionary in that they were based on levels were animals had incurred TTS. We are currently working on finalizing Acoustic Guidance that will identify revised TTS and PTS thresholds that references the studies identified by NRDC et al. In order to ensure the best possible product, the process for developing the revised thresholds includes both peer and public review (both of which have already occurred) and NMFS will begin applying the new thresholds once the peer and public input have been addressed and the Acoustic Guidance is finalized.

Regarding the Lucke et al. (2009) study, the authors found a threshold shift (TS) of a harbor porpoise after exposing it to airgun noise (single pulse) with a received sound pressure level (SPL) at 200.2 dB (peak –to-peak) re 1  $\mu$ Pa, which corresponds to a sound exposure level of 164.5 dB re 1  $\mu$ Pa<sup>2</sup> s after integrating exposure. We currently use the root-mean-square (rms) of received SPL at 180 dB and 190 dB re 1  $\mu$ Pa as the threshold above which permanent threshold shift (PTS) could occur for cetaceans and pinnipeds, respectively. Because the airgun noise is a broadband impulse, one cannot directly extrapolate the equivalent of rms SPL from the reported peak-to-peak SPLs reported in Lucke et al. (2009). However, applying a conservative conversion factor of 16 dB for broadband signals from seismic surveys (Harris et al., 2001; McCauley et al., 2000) to correct for the difference between peak-to-peak levels reported in Lucke et al. (2009) and rms SPLs; the rms SPL for TTS would be approximately 184 dB re 1  $\mu$ Pa, and the received levels associated with PTS (Level A harassment) would be higher. This is still above the current 180 dB rms re 1  $\mu$ Pa threshold for injury. Yet, NMFS recognizes that the temporary threshold shift (TTS) of harbor porpoise is lower than other cetacean species empirically tested (Finneran et al., 2002; Finneran and Schlundt, 2010; Kastelein et al., 2012). We considered this information in the notice of the proposed Authorization (79 FR 44549, July 31, 2014).

The Thompson et al. (1998) telemetry study on harbor (Phoca vitulina) and grey seals (Halichoerus grypus) suggested that avoidance and other behavioral reactions by individual seals to

small airgun sources may at times be strong, but short-lived. The researchers conducted 1-hour controlled exposure experiments exposing individual seals fitted with telemetry devices to small airguns with a reported source level of 215-224 dB re 1  $\mu$ Pa (peak-to-peak) (Thompson et al., 1998; Gordon et al., 2003). The researchers measured dive behavior, swim speed heart rate and stomach temperature (indicator for feeding), but they did not measure hearing threshold shift in the animals. The researchers observed startle responses, decreases in heart rate, and temporary cessation of feeding. In six out of eight trials, harbor seals exhibited strong avoidance behaviors, and swam rapidly away from the source (Thompson et al., 1998; Gordon et al., 2003). One seal showed no detectable response to the airguns, approaching within 300 m (984 ft) of the source (Gordon et al., 2003). However, they note that the behavioral responses were short-lived and the seals' behavior returned to normal after the trials (Thompson et al., 1998; Gordon et al., 2003). The study does not discuss temporary threshold shift or permanent threshold shift in harbor seals and the estimated rms SPL for this survey is approximately 200 dB re 1  $\mu$ Pa, well above NMFS's current 180 dB rms re: 1  $\mu$ Pa threshold for injury for cetaceans and our current 190 dB rms re 1  $\mu$ Pa threshold for injury for pinnipeds (accounting for the fact that the rms sound pressure level (in dB) is typically 16 dB less than the peak-to-peak level).

In a study on the effect of non-impulsive sound sources on marine mammal hearing, Kastak et al. (2008) exposed one harbor seal to an underwater 4.1 kHz pure tone fatiguing stimulus with a maximum received sound pressure of 184 dB re 1  $\mu$ Pa for 60 seconds (Kastak et al., 2008; Finneran and Branstetter, 2013). A second 60-second exposure resulted in an estimated threshold shift of greater than 50 dB at a test frequency of 5.8 kHz (Kastak et al., 2008). The seal recovered at a rate of -10 dB per log (min). However, 2 months post-exposure, the researchers observed incomplete recovery from the initial threshold shift resulting in an apparent permanent threshold shift of 7 to 10 dB in the seal (Kastak et al., 2008). We note that seismic sound is an impulsive source, and the

context of the study is related to the effect of non-impulsive sounds on marine mammals.

We also considered two other Kastak et al. (1999, 2005) studies. Kastak et al. (1999) reported TTS of approximately 4-5 dB in three species of pinnipeds (harbor seal, California sea lion, and northern elephant seal) after underwater exposure for approximately 20 minutes to sound with frequencies ranging from 100 to 2,000 Hz at received levels 60 to 75 dB above hearing threshold. This approach allowed similar effective exposure conditions to each of the subjects, but resulted in variable absolute exposure values depending on subject and test frequency. The authors reported recovery to near baseline levels within 24 hours of sound exposure. Kastak et al. (2005) followed up on their previous work, exposing the same test subjects to higher levels of sound for longer durations. They exposed the animals to octave-band sound for up to 50 minutes of net exposure. The study reported that the harbor seal experienced TTS of 6 dB after a 25-minute exposure to 2.5 kHz of octave-band sound at 152 dB (183 dB SEL). The California sea lion demonstrated onset of TTS after exposure to 174 dB (206 dB SEL).

We acknowledge that PTS could occur if an animal experiences repeated exposures to TTS levels. However, an animal would need to stay very close to the sound source for an extended amount of time to incur a serious degree of PTS, which in this case, it would be highly unlikely due to the required mitigation measures in place to avoid Level A harassment and the expectation that a mobile marine mammal would generally avoid an area where received sound pulse levels exceed 160 dB re 1  $\mu$ Pa (rms) (review in Richardson et al., 1995; Southall et al., 2007).

We also considered recent studies by Kujawa and Liberman (2009) and Lin et al. (2011). These studies found that despite completely reversible threshold shifts that leave cochlear sensory cells intact, large threshold shifts (40 to 50 dB) could cause synaptic level changes and delayed cochlear nerve degeneration in mice and guinea pigs, respectively. We note that the high level of TTS that led to the synaptic changes shown in these studies is in the range of the high degree of TTS that

Southall et al. (2007) used to calculate PTS levels. It is not known whether smaller levels of TTS would lead to similar changes. We, however, acknowledge the complexity of noise exposure on the nervous system, and will re-examine this issue as more data become available.

In contrast, a recent study on bottlenose dolphins (Schlundt, et al., 2013) measured hearing thresholds at multiple frequencies to determine the amount of TTS induced before and after exposure to a sequence of impulses produced by a seismic airgun. The airgun volume and operating pressure varied from 40 to 150 in<sup>3</sup> and 1,000 to 2,000 psi, respectively. After three years and 180 sessions, the authors observed no significant TTS at any test frequency, for any combinations of airgun volume, pressure, or proximity to the dolphin during behavioral tests (Schlundt, et al., 2013). Schlundt et al. (2013) suggest that the potential for airguns to cause hearing loss in dolphins is lower than previously predicted, perhaps as a result of the low-frequency content of airgun impulses compared to the high-frequency hearing ability of dolphins.

Comment 34: NRDC et al. states that the potential impacts on marine species from sound-producing sources other than airguns were not meaningfully evaluated. The commenters state that an independent scientific review panel implicated a 12 kHz multi-beam echosounder operated by an ExxonMobil survey vessel off the coast of Madagascar in the mass stranding of melon-headed whales in 2008. NRDC states that based on the correlation between these previous stranding events and the use of multi-beam echosounder technology, it is imperative that we fully assess the potential for this source to impact marine mammals both on its own and with the operation of the airgun array.

Response: NMFS disagrees with the commenter's assessment that we did not meaningfully evaluate the potential impacts on marine species from sound-producing sources other than airguns. We assessed the potential for the operation of the multi-beam echosounder, sub-bottom profiler, and acoustic Doppler current profiler to impact marine mammals, both on their own and simultaneously



with the operation of the airgun array. We assume that, during simultaneous operations of the airgun array and the other sources, any marine mammals close enough to be affected by the active sound sources would already be affected by the airguns. However, whether or not the airguns are operating simultaneously with the other sources, we expect marine mammals to exhibit no more than short-term and inconsequential responses to the multi-beam echosounder and sub-bottom profiler given their characteristics (e.g., narrow, downward-directed beam) and other considerations described previously in the notice of the proposed IHA (79 FR 44549, July 31, 2014). Such reactions are not considered to constitute “taking” (NMFS, 2001). Therefore, Lamont-Doherty provided no additional allowance for animals that could be affected by sound sources other than airguns and we have not authorized take from these other sound sources. Moreover, the Authorization prohibits the use of the sound sources during transits at the beginning and end of the planned seismic survey; therefore, we do not expect any potential impacts from these sound sources in shallow water or coastal areas.

Comment 35: NRDC et al. state that the Foundation fails to adequately assess cumulative impacts of the activity. NRDC et al. state that NMFS and the Foundation must analyze both auditory and behavioral impacts of repeated exposure to noise pollution on a population that may alter behavior. NRDC et al. also state that the cumulative impact analysis must include a full evaluation of the cumulative impacts of oil and gas seismic surveys planned for and anticipated in the Atlantic; the Lamont-Doherty seismic survey off New Jersey and other Foundation or USGS planned seismic surveys; and military and testing sonar activities.

Response: We disagree with commenters’ assessment. The Foundation’s EA, our EA, and the documents they incorporate analyze the effects of the seismic survey in light of other human activities in the study area, including the activities the commenters reference. The NSF/USGS PEIS, which the Foundation’s EA tiers to, also analyzes the cumulative impacts of NSF-funded and USGS-conducted seismic surveys. Both the Foundation’s EA and our EA, conclude that the impacts

of Lamont-Doherty’s proposed seismic survey in the Atlantic Ocean would be more than minor and short-term with no potential to contribute to cumulatively significant impacts. As explained in our FONSI, we expect the following combination of activities to result in no more than minor and short-term impacts to marine mammals in the survey area in terms of overall disturbance effects: (1) our issuance of an Authorization with prescribed mitigation and monitoring measures for the seismic survey; (2) past, present, and reasonably foreseeable future research in the northwest Atlantic Ocean; (3) military activities; and (4) oil and gas activities. We also note that section 4.1.2.3 of the NSF/USGS PEIS specifically addresses the cumulative impacts of repeated exposure to noise, including potential exposure to multiple Foundation-sponsored or USGS seismic surveys and potential exposure to their seismic surveys and other activities that produce underwater noise. It states that “no impacts are anticipated at the regional population level. The few, relatively short, localized Foundation or USGS seismic surveys in the context of the ocean-region basis would not have more than a negligible cumulative effect on marine mammals at the individual or population level. Possible exceptions are local non-migratory populations or populations highly concentrated in one area at one of year (e.g., for breeding). However, the latter scenario would be mitigated by timing and locating proposed seismic surveys to avoid sensitive seasons and/or locations important to marine mammals, especially those that are ESA-listed.” It further states that “there is no evidence that [short-term behavioral changes], whether considered alone or in succession, result in long-term adverse impacts to individuals or populations assuming important habitats or activities are not disturbed. Furthermore, long-migrating marine mammals in particular have undoubtedly been exposed to many anthropogenic underwater sound activities for decades in all ocean basins. Many of these populations continue to grow despite a preponderance of anthropogenic marine activities that may have been documented to disturb some individuals behaviorally (e.g., Hildebrand, 2004).”

## Monitoring and Reporting

Comment 36: The Commission believes that we misinterpreted our implementing regulations, which require that applicants include “the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities, and suggested means of minimizing burdens by coordinating such reporting requirements with other schemes already applicable to persons conducting such activity.” The Commission believes that monitoring and reporting requirements need to be sufficient to provide accurate information on the numbers of marine mammals being taken and the manner in which they are taken, not merely better information on the qualitative nature of the impacts. The Commission continues to believe that appropriate  $g(0)$  and  $f(0)$  values are essential for making accurate estimates of the numbers of marine mammals taken during surveys. The Commission recommends that we consult with the funding agency (e.g., the Foundation) and individual applicants (e.g., Lamont-Doherty and other related entities) to develop, validate, and implement a monitoring program that provides a scientifically sound, reasonably accurate assessment of the types of marine mammal takes and the actual numbers of marine mammals taken, accounting for applicable  $g(0)$  and  $f(0)$  values.

Response: We do not believe that we misinterpreted the MMPA implementing regulations in our previous response that the Commission references. In the sentence quoted by the Commission, if we assume that the phrase “increased knowledge of” does not modify “the level of taking,” that the phrase it would read: “the suggested means of accomplishing the necessary monitoring and reporting that will result in...the level of taking or impacts on populations,” which does not make sense. However, even putting the unclear grammatical issue aside, we do not believe that an appropriate interpretation of the regulations suggests that the monitoring of an authorized entity

must be able to quantify the exact number of takes that occurred during the action, but rather that the monitoring increase understanding of the level and effects of the action. In fact, the Commission's comment supports this interpretation. As noted by the Commission, section 101(a)(5)(D)(iv) requires that NMFS "modify, suspend, or revoke an authorization" if it finds, among other things, that the authorized taking is having more than a negligible impact or that more than small numbers of marine mammals are being taken. Both of these findings, negligible impact and small numbers, may be made using qualitative, or relative (to the stock abundance) information, and the sorts of qualitative, or more relative, information collected during the wide variety of monitoring that is conducted pursuant to MMPA authorizations can either be used to provide broad support for the findings underlying the issuance of an Authorization or can highlight red flags that might necessitate either a reconsideration of an issued Authorization or a change in analyses in future authorizations. Our previous response is included here for reference.

Our implementing regulations require that applicants include monitoring that will result in "an increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities..." This increased knowledge of the level of taking could be qualitative or relative in nature, or it could be more directly quantitative. Scientists use  $g(0)$  and  $f(0)$  values in systematic marine mammal surveys to account for the undetected animals indicated above, however, these values are not simply established and the  $g(0)$  value varies across every observer based on their sighting acumen. While we want to be clear that we do not generally believe that post-activity take estimates using  $f(0)$  and  $g(0)$  are required to meet the monitoring requirement of the MMPA, in the context of the Foundation and Lamont-Doherty's monitoring plan, we agree that developing and incorporating a way to better interpret the results of their monitoring (perhaps a simplified or generalized version of  $g(0)$  and  $f(0)$ ) is a good idea. We are continuing to examine this issue with Lamont-Doherty and NSF to develop ways to

improve their post-survey take estimates. We will consult with the Commission and NMFS scientists prior to finalizing these recommendations.

We note that current monitoring measures for past and current Authorizations for research seismic surveys require the collection of visual observation data by protected species observers prior to, during, and after airgun operations. This data collection may contribute to baseline data on marine mammals (presence/absence) and provide some generalized support for estimated take numbers (as well as providing data regarding behavioral responses to seismic operation that are observable at the surface). However, it is unlikely that the information gathered from these cruises along would result in any statistically robust conclusions for any particular species because of the small number of animals typically observed.

Comment 37: Dr. Pabst expresses uncertainty as to whether the tow depth of the passive acoustic monitoring system (approximately 20 m (60 ft)) is sufficient to detect beaked whale vocalizations, which usually occur only beyond the 400 m (1,312 ft) depth. She requests more information on the effectiveness of monitoring for beaked whales.

Response: The PAM system can detect beaked whales at depth. Selecting a tow depth of 20-m enhances its detection capability because the device would be below swells and surface noise. The Langseth's PAM system consists of wide-band hydrophones with a frequency range up to 200 kHz (-3 dB points). An electronics unit provides power and connection for the hydrophone array cable (via the ITT connector) and transfers the sound signal into high and low frequency ranges through internal circuitry to allow for further processing. The system feeds high frequency (analog) sound from each of the hydrophones in the array through an internal National Instruments USB-6251 sampling card capable of sampling audio at 500 kHz. Pamguard, the primary detection and software, operates with a variety of displays configured with detectors, mapping tools, and sound processing modules. A typical Pamguard configuration will consist of spectrograms, low and high

frequency click detectors, whistle and moan detectors, and a map module. An acoustician can configure the high frequency click detector to receive raw data directly from the sound card and sample at up to 500 kHz. The operator can classify individual clicks from the click detector using the “Classifier with frequency sweep,” which uses parameters suitable for the detection of beaked whales.

#### Other Environmental Statutes

Comment 38: NRDC et al. states that we failed to analyze impacts on fish and other species of concern. NRDC et al. state that the proposed Authorization assumes without support that effects on both fish and fisheries would be localized and minor. NRDC et al. urges improvement in our analysis.

Response: We disagree with NRDC et al.’s assessment. The Foundation’s EA, which describes marine fish in section 3, EFH in section 3.2, and considers the impacts of the survey on fish, EFH and fisheries in section 4. The Foundation’s EA tiers to the NSF/USGS PEIS, which also analyzes the impacts of seismic surveys on fish. All of the studies cited by NRDC et al. regarding fish are cited in the NSF/USGS PEIS (Appendix D) together with numerous additional studies that document the limited and sometimes conflicting knowledge about the acoustic capabilities of fish and the effects of airgun sound on fish. The EA’s conclusion that “the direct effects of the seismic survey and its noise may have minor effects on marine fisheries that are generally reversible, of limited duration, magnitude, and geographic extent when considering individual fish, and not measurable at the population level” is well supported. NMFS also evaluated the impacts of the seismic survey on fish and invertebrates in the notice of the proposed Authorization (79 FR 44549, July 31, 2014). We included a detailed discussion of the potential effects of this action on marine mammal habitat, including physiological and behavioral effects on marine fish and invertebrates.

Comment 39: NRDC et al. states that the Foundation did not provide any meaningful analysis

of the proposed action's impacts on essential fish habitat (EFH). NRDC et al. states that we have a statutory obligation to consult on the impact of federal activities on EFH under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). NRDC et al. states that the EFH consultation for the action is inadequate.

Response: We disagree with the commenters' assessment. As discussed in the response to Comment 38, the NSF/USGS PEIS, the Foundation's EA, and other environmental assessments identify EFH within the project area and evaluate the impacts of the seismic survey on EFH. The Foundation's EA (see section 3) and the NSF/USGS PEIS (see section 3.3.2.1) discuss the seismic survey's impacts on EFH.

The Foundation requested a determination from the NMFS, Habitat Conservation Divisions of the Southeast Regional and Greater Atlantic Regional Fisheries Offices, whether the seismic survey required a formal consultation. In a letter dated August 7, 2014, NMFS stated that in accordance with the MSA, EFH has been identified and described in the EEZ portions of the study area by the Mid-Atlantic and South Atlantic Fishery Management Councils and NMFS. The letter acknowledged that Lamont-Doherty and the Foundation, as the federal action agency for this action, determined the proposed seismic survey may result in minor adverse impacts to water column habitats identified and described as EFH. NMFS stated that the Habitat Conservation Divisions in the Southeast Regional Office reviewed that analysis and the proposed mitigation measures contained in the NSF/USGS PEIS and the EA prepared for this action. Upon considering the design and nature of the seismic survey, NMFS had no EFH conservation recommendations to provide pursuant to section 305 (b)(2) of the MSA. NMFS stated additional research and monitoring would help to gain a better understanding of the potential effects these activities may have on EFH, federally managed species, their prey and other NOAA trust resources, and recommended that this type of research should be a component of future NSF-funded seismic surveys. The Foundation

agreed that this is an area of needed research. Consistent with other proposals for seismic activities directly affecting areas of the seafloor within a hard-bottom EFH-HAPC, NMFS recommended that Lamont-Doherty maintain a 500-meter buffer from coral/hard bottom habitats before placement of any anchors or anchoring systems.

The issuance of an IHA and the mitigation and monitoring measures required by the Authorization would not affect ocean and coastal habitat or EFH. Therefore, NMFS, Office of Protected Resources, Permits and Conservation Division has determined that an EFH consultation is not required.

Comment 40: NRDC et al. states that we must fully comply with the ESA and develop a robust Biological Opinion based on the best available science. They further urge us to establish more stringent mitigation measures to protect ESA-listed species than are currently proposed by the Authorization.

Response: Section 7(a)(2) of the ESA requires that each federal agency insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. Of the species of marine mammals that may occur in the action area, several are listed as endangered under the ESA, including the North Atlantic right, humpback, sei, fin, blue, and sperm whales. Under section 7 of the ESA, the Foundation initiated formal consultation with the NMFS, Office of Protected Resources, Endangered Species Act Interagency Cooperation Division, on this seismic survey. NMFS's Office of Protected Resources, Permits and Conservation Division, also initiated and engaged in formal consultation under section 7 of the ESA with NMFS's Office of Protected Resources, Endangered Species Act Interagency Cooperation Division, on the issuance of an IHA under section 101(a)(5)(D) of the MMPA for this activity. These two consultations were consolidated and addressed in a single Biological Opinion addressing



the effects of the proposed actions on threatened and endangered species as well as designated critical habitat. The Biological Opinion concluded that both actions (i.e., Lamont-Doherty's seismic survey and our issuance of an Authorization) are not likely to jeopardize the existence of cetaceans and sea turtles and would have no effect on critical habitat. NMFS's Office of Protected Resources, Endangered Species Act Interagency Cooperation Division relied on the best scientific and commercial data available in conducting its analysis.

Although critical habitat is designated for the North Atlantic right whale, no critical habitat for North Atlantic right whales occurs in the action area. The North Atlantic right whale critical habitat in the northeast Atlantic Ocean can be found online at:

[http://www.nmfs.noaa.gov/pr/pdfs/criticalhabitat/n\\_rightwhale\\_ne.pdf](http://www.nmfs.noaa.gov/pr/pdfs/criticalhabitat/n_rightwhale_ne.pdf). The North Atlantic right

whale critical habitat in the southeast Atlantic Ocean can be found online at:

[http://www.nmfs.noaa.gov/pr/pdfs/criticalhabitat/n\\_rightwhale\\_se.pdf](http://www.nmfs.noaa.gov/pr/pdfs/criticalhabitat/n_rightwhale_se.pdf). The trackline that has the closest approach to the southeast Atlantic Ocean designated critical habitat is approximately 470 km (292 mi) from the area. The Biological Opinion considers the distribution, migration and movement, general habitat, and designated critical habitat of the North Atlantic right whale in its analysis.

NMFS's Office of Protected Resources, Permits and Conservation Division also considered the conservation status and habitat of ESA-listed marine mammals. Included in the Authorization are special procedures for situations or species of concern (see "Mitigation" section below). If observers see a North Atlantic right whale during the survey, the airgun array must be shut-down regardless of the distance of the animal(s) to the sound source. The array will not resume firing until 30 minutes after the last documented whale visual sighting. Concentrations of humpback, sei, fin, blue, and/or sperm whales will be avoided if possible (i.e., exposing concentrations of animals to 160 dB), and the array will be powered-down if necessary. For purposes of the survey, a concentration or group of whales will consist of six or more individuals visually sighted that do not

appear to be traveling (e.g., feeding, socializing, etc.). NMFS's Office of Protected Resources, Endangered Species Act Interagency Cooperation Division issued an Incidental Take Statement (ITS) incorporating the requirements of the Authorization as Terms and Conditions of the ITS. Compliance with the ITS is likewise a mandatory requirement of the Authorization. NMFS's Office of Protected Resources, Permits and Conservation Division has determined that the mitigation measures required by the Authorization provide the means of effecting the least practicable impact on species or stocks and their habitat, including ESA-listed species.

Comment 41: NRDC et al. states that the Coastal Zone Management Act (CZMA) requires that applicants for federal permits to conduct an activity affecting a natural resource of the coastal zone of a state "shall provide in the application to the licensing or permitting agency a certification that the proposed activity complies with the enforceable policies of the state's approved program and that such activity will be conducted in a manner consistent with the program." NRDC et al. states that the marine mammals and fish that will be affected by the seismic survey are all "natural resources" protected by the coastal states' coastal management program, and that states should be given the opportunity to review the Authorization for consistency with their coastal management programs.

Response: As the lead federal agency for the planned seismic survey, the Foundation considered whether the action would have effects on the coastal resources of North Carolina and Virginia and consulted with both states. The state of North Carolina evaluated the proposed project for consistency with their coastal management program and submitted their consistency concurrence to the Foundation on September 8, 2014. The determination requests the Foundation to abide by mitigation measures for marine mammals, including; conducting 60 minutes of visible monitoring for marine mammals prior to starting the airguns; using a passive acoustic monitoring system; and having at least two protected species visual observers on watch during daylight hours. The

Foundation has agreed to follow, to the maximum extent practicable, that state's mitigation measures. Therefore, the Foundation has met all of the responsibilities under the CZMA. The Foundation also discussed the proposed seismic survey with NOAA's Office of Ocean and Coastal Resource Management to confirm their responsibilities under CZMA for the planned unlisted activity.

Comment 42: Several private citizens and the Towns of Nags Head and Kill Devil Hills, NC opposed the issuance of an Authorization by us and the conduct of the seismic survey in the Atlantic Ocean offshore North Carolina.

Response: As described in detail in the notice for the proposed Authorization (79 FR 44549, July 31, 2014), as well as in this document, we do not believe that Lamont-Doherty's seismic survey would cause injury, serious injury, or mortality to marine mammals, and no take by injury, serious injury, or mortality is authorized. The required monitoring and mitigation measures that Lamont-Doherty will implement during the seismic survey will further reduce the potential impacts on marine mammals to the lowest levels practicable. We anticipate only behavioral disturbance to occur during the conduct of the seismic survey.

Finally, the NSF/USGS PEIS, the Foundation's EA for this survey, and our EA analyzed the cumulative impacts of NSF-funded seismic surveys. These documents supported our analyses that the impacts of Lamont-Doherty's proposed seismic survey in the Atlantic Ocean would be more than minor and short-term with no potential to contribute to cumulatively significant impacts.

#### Description of Marine Mammals in the Area of the Specified Activity

We provided information on the occurrence of marine mammals with possible or confirmed occurrence in the survey area in the notice of proposed Authorization on July 31, 2014 (79 FR 44549). The marine mammals most likely to be harassed in the action include 6 mysticetes, 23 odontocetes, and 1 pinniped species under our jurisdiction. Table 2 in this notice provides

information on those species' regulatory status under the MMPA and the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.); abundance; occurrence and seasonality in the activity area.

**Table 2** – Marine mammals most likely to be harassed incidental to Lamont-Doherty's survey.

Species	Stock Name	Regulatory Status <sup>1, 2</sup>	Stock/Species Abundance <sup>3</sup>	Range	Seasonal Occurrence
<b>North Atlantic right whale</b>	Western Atlantic	MMPA - D ESA – EN	455	Coastal/shelf	Uncommon
<b>Humpback whale</b>	Gulf of Maine	MMPA - D ESA – EN	823	Pelagic	Uncommon
Minke whale	Canadian East Coast	MMPA - D ESA – NL	20,741	Coastal/shelf	Uncommon
<b>Sei whale</b>	Nova Scotia	MMPA - D ESA – EN	357	Offshore	Rare
<b>Fin whale</b>	Western North Atlantic	MMPA - D ESA – EN	3,522	Pelagic	Rare
<b>Blue whale</b>	Western North Atlantic	MMPA - D ESA – EN	440 <sup>4</sup>	Coastal/pelagic	Rare
Bryde's whale	NA	MMPA - D ESA – NL	11,523 <sup>5</sup>	Shelf/pelagic	Uncommon
<b>Sperm whale</b>	Nova Scotia	MMPA - D ESA – EN	2,288	Pelagic	Common
Dwarf sperm whale	Western North Atlantic	MMPA - NC ESA – NL	3,785	Off Shelf	Uncommon
Pygmy sperm whale	Western North Atlantic	MMPA - NC ESA – NL	3,785	Off Shelf	Uncommon
Blainville's beaked whale	Western North Atlantic	MMPA - NC ESA – NL	7,092	Pelagic	Rare
Cuvier's beaked whale	Western North Atlantic	MMPA - NC ESA – NL	6,532	Pelagic	Uncommon
Gervais' beaked whale	Western North Atlantic	MMPA - NC ESA – NL	7,092	Pelagic	Rare
True's beaked whale	Western North Atlantic	MMPA - NC ESA – NL	7,092	Pelagic	Rare
Rough-toothed dolphin	Western North Atlantic	MMPA - NC ESA – NL	271	Pelagic	Uncommon
Bottlenose dolphin	Western North Atlantic Offshore	MMPA - NC ESA – NL	77,532	Pelagic	Common
	Western North Atlantic Southern Migratory Coastal	MMPA – D, S ESA – NL	9,173	Coastal	Common
	WNA Southern NC Estuarine System	MMPA – D, S ESA – NL	188	Coastal	Common
	WNA Northern NC Estuarine System	MMPA – D, S ESA – NL	950	Coastal	Common
Pantropical spotted dolphin	Western North Atlantic	MMPA - NC ESA – NL	3,333	Pelagic	Common
Atlantic spotted dolphin	Western North Atlantic	MMPA - NC ESA – NL	44,715	Shelf/slope pelagic	Common
Spinner dolphin	Western North Atlantic	MMPA - NC ESA – NL	11,441 <sup>6</sup>	Coastal/pelagic	Rare
Striped dolphin	Western North Atlantic	MMPA - NC ESA – NL	54,807	Off shelf	Common
Clymene dolphin	Western North Atlantic	MMPA - NC ESA – NL	6,086 <sup>7</sup>	Slope	Uncommon
Short-beaked common dolphin	Western North Atlantic	MMPA - NC ESA – NL	173,486	Shelf/pelagic	Common

Atlantic white-sided-dolphin	Western North Atlantic	MMPA - NC ESA – NL	48,819	Shelf/slope	Rare
Fraser’s dolphin	Western North Atlantic	MMPA - NC ESA – NL	726 <sup>8</sup>	Pelagic	Rare
Risso’s dolphin	Western North Atlantic	MMPA - NC ESA – NL	18,250	Shelf/slope	Common
Melon-headed whale	Western North Atlantic	MMPA - NC ESA – NL	2,283 <sup>9</sup>	Pelagic	Rare
False killer whale	Northern Gulf of Mexico	MMPA - NC ESA – NL	177 <sup>10</sup>	Pelagic	Rare
Pygmy killer whale	Western North Atlantic	MMPA - NC ESA – NL	1,108 <sup>11</sup>	Pelagic	Rare
Killer whale	Western North Atlantic	MMPA - NC ESA – NL	28 <sup>12</sup>	Coastal	Rare
Long-finned pilot whale	Western North Atlantic	MMPA - NC ESA – NL	26,535	Pelagic	Common
Short-finned pilot whale	Western North Atlantic	MMPA - NC ESA – NL	21,515	Pelagic	Common
Harbor porpoise	Gulf of Maine/ Bay of Fundy	MMPA - NC ESA – NL	79,883	Coastal	Rare
Harbor seal	Western North Atlantic	MMPA - NC ESA – NL	70,142	Coastal	Uncommon

<sup>1</sup> MMPA: D = Depleted, S = Strategic, NC = Not Classified.

<sup>2</sup> ESA: EN = Endangered, T = Threatened, DL = Delisted, NL = Not listed.

<sup>3</sup> 2013 NMFS Stock Assessment Report (Waring *et al.*, 2014) unless otherwise noted. NA = Not Available.

<sup>4</sup> Minimum population estimate based on photo identification studies in the Gulf of St. Lawrence (Waring *et al.*, 2010).

<sup>5</sup> There is no stock designation for this species in the Atlantic. Abundance estimate derived from the ETP stock = 11,163 (Wade and Gerodette, 1993); Hawaii stock = 327 (Barlow, 2006); and Northern Gulf of Mexico stock = 33 (Waring *et al.*, 2013).

<sup>6</sup> There is no abundance information for this species in the Atlantic. Abundance estimate derived from the Northern Gulf of Mexico Stock = 11,441 (Waring *et al.*, 2014).

<sup>7</sup> There is no abundance information for this species in the Atlantic. The best available estimate of abundance was 6,086 (CV=0.93) (Mullin and Fulling, 2003).

<sup>8</sup> There is no abundance information for this species in the Atlantic. The best available estimate of abundance was 726 (CV=0.70) for the Gulf of Mexico stock (Mullin and Fulling, 2004).

<sup>9</sup> There is no abundance information for this species in the Atlantic. The best available estimate of abundance was 2,283 (CV=0.76) for the Gulf of Mexico stock (Mullin, 2007).

<sup>10</sup> There is no abundance information for this species in the Atlantic. The best available estimate of abundance was 177 (CV=0.56) for the Gulf of Mexico stock (Mullin, 2007).

<sup>11</sup> There is no abundance information for this species in the Atlantic. Abundance estimate derived from the Northern Gulf of Mexico stock = 152 (Mullin, 2007) and the Hawaii stock = 956 (Barlow, 2006).

<sup>12</sup> There is no abundance information for this species in the Atlantic. Abundance estimate derived from the Northern Gulf of Mexico stock = 28 (Waring *et al.*, 2014).

Lamont-Doherty presented species information in Table 2 of their application but excluded information on pinnipeds because they anticipated that these species would have a more northerly distribution during the summer and thus have a low likelihood of occurring in the survey area. Based on the best available information, we expect that harbor seals, however, have the potential to occur within the survey area and we have therefore included additional information for these species. For the Authorization, we are authorizing take for pinnipeds based upon the best available

information (Read et al., 2003).

We refer the public to Lamont-Doherty's application, the Foundation's EA (see ADDRESSES), our EA, and the 2013 NMFS Marine Mammal Stock Assessment Report available online at:

<http://www.nmfs.noaa.gov/pr/sars/species.htm> for further information on the biology and local distribution of these species.

#### Potential Effects of the Specified Activities on Marine Mammals

We provided a summary and discussion of the ways that the types of stressors associated with the specified activity (e.g., seismic airgun operations, vessel movement, and entanglement) impact marine mammals (via observations or scientific studies) in the notice of proposed Authorization on July 31, 2014 (79 FR 44549).

The "Estimated Take by Incidental Harassment" section later in this document will include a quantitative discussion of the number of marine mammals that we anticipate may be taken by this activity. The "Negligible Impact Analysis" section will include a discussion of how this specific activity will impact marine mammals. The Negligible Impact analysis considers the anticipated level of take and the effectiveness of mitigation measures to draw conclusions regarding the likely impacts of this activity on the reproductive success or survivorship of individuals and from that on the affected marine mammal populations or stocks.

Operating active acoustic sources, such as airgun arrays, has the potential for adverse effects on marine mammals. The majority of anticipated impacts would be from the use of acoustic sources. The effects of sounds from airgun pulses might include one or more of the following: tolerance, masking of natural sounds, behavioral disturbance, and temporary or permanent hearing impairment or non-auditory effects (Richardson et al., 1995). However, for reasons discussed in the proposed Authorization, it is very unlikely that there would be any cases of temporary or permanent hearing impairment resulting from Lamont-Doherty's activities. As outlined in previous NMFS documents,

the effects of noise on marine mammals are highly variable, often depending on species and contextual factors (based on Richardson et al., 1995).

In the “Potential Effects of the Specified Activity on Marine Mammals” section of the notice of proposed Authorization on July 31, 2014 (79 FR 44549), we included a qualitative discussion of the different ways that Lamont-Doherty’s seismic survey may potentially affect marine mammals. Marine mammals may behaviorally react to sound when exposed to anthropogenic noise. These behavioral reactions are often shown as: changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); avoidance of areas where noise sources are located; and/or flight responses (e.g., pinnipeds flushing into water from haulouts or rookeries).

Masking is the obscuring of sounds of interest by other sounds, often at similar frequencies. Marine mammals use acoustic signals for a variety of purposes, which differ among species, but include communication between individuals, navigation, foraging, reproduction, avoiding predators, and learning about their environment (Erbe and Farmer, 2000; Tyack, 2000). Masking, or auditory interference, generally occurs when sounds in the environment are louder than, and of a similar frequency as, auditory signals an animal is trying to receive. Masking is a phenomenon that affects animals that are trying to receive acoustic information about their environment, including sounds from other members of their species, predators, prey, and sounds that allow them to orient in their environment. Masking these acoustic signals can disturb the behavior of individual animals, groups of animals, or entire populations. For the airgun sound generated from Lamont-Doherty’s seismic survey, sound will consist of low frequency (under 500 Hz) pulses with extremely short durations (less than one second). Masking from airguns is more likely in low-frequency marine mammals like

mysticetes. There is little concern that masking would occur near the sound source due to the brief duration of these pulses and relative silence between air gun shots (approximately 22 during the MCS portion of the survey and approximately 65 seconds during the OBS portion). Masking is less likely for mid- to high-frequency cetaceans and pinnipeds.

Hearing impairment (either temporary or permanent) is also unlikely. Given the higher level of sound necessary to cause permanent threshold shift as compared with temporary threshold shift, it is considerably less likely that permanent threshold shift would occur during the seismic survey. Cetaceans generally avoid the immediate area around operating seismic vessels, as do some other marine mammals. Some pinnipeds show avoidance reactions to airguns.

The Langseth will operate at a relatively slow speed (typically 4.6 knots (8.5 km/h; 5.3 mph)) when conducting the survey. Protected species observers would implement mitigation measures to ensure the least practicable adverse effect to marine mammals. Therefore, we neither anticipate nor will we authorize takes of marine mammals from ship strikes.

We refer the reader to Lamont-Doherty's application, our EA, and the Foundation's EA for additional information on the behavioral reactions (or lack thereof) by all types of marine mammals to seismic vessels. We have reviewed these data along with new information submitted during the public comment period and determined them to be the best available information for the purposes of the Authorization.

#### Anticipated Effects on Marine Mammal Habitat

We included a detailed discussion of the potential effects of this action on marine mammal habitat, including physiological and behavioral effects on marine mammal prey items (e.g., fish and invertebrates) in the notice of proposed Authorization on July 31, 2014 (79 FR 44549) and in our EA. While we anticipate that the specified activity may result in marine mammals avoiding certain areas due to temporary ensonification, the impact to habitat is temporary and reversible. Further, we



also considered these impacts to marine mammals in detail in the notice of proposed Authorization as behavioral modification. The main impact associated with the activity would be temporarily elevated noise levels and the associated direct effects on marine mammals.

## Mitigation

In order to issue an incidental take authorization under section 101(a)(5)(D) of the MMPA, we must prescribe, where applicable, the permissible methods of taking pursuant to such activity, and other means of effecting the least practicable adverse impact on such species or stocks and their habitat (i.e., mitigation), paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for taking for certain subsistence uses (where relevant). Our duty under this least practicable adverse impact standard is to prescribe mitigation reasonably designed to minimize, to the extent practicable, any adverse population level impacts, as well as habitat impacts. While one can minimize population-level impacts only by reducing impacts on individual marine mammals, not all take translates to population-level impacts. Thus, our objective under the least practicable adverse impact standard is to design mitigation targeting those impacts on individual marine mammals that would most likely lead to adverse population-level effects (78 FR at 78113 and 78135).

Lamont-Doherty has reviewed the following source documents and has incorporated a suite of proposed mitigation measures into their project description.

(1) Protocols used during previous Foundation and Lamont-Doherty-funded seismic research cruises as approved by us and detailed in the Foundation's 2011 PEIS and 2014 EA;

(2) Previous incidental harassment authorization applications and authorizations that we have approved and authorized; and

(3) Recommended best practices in Richardson et al. (1995), Pierson et al. (1998), and Weir and Dolman, (2007).

To reduce the potential for disturbance from acoustic stimuli associated with the activities, Lamont-Doherty, and/or its designees have proposed to implement the following mitigation measures for marine mammals:

- (1) Vessel-based visual mitigation monitoring;
- (2) Proposed exclusion zones and expanded exclusion zones in shallow water;
- (3) Power-down procedures;
- (4) Shutdown procedures;
- (5) Ramp-up procedures;
- (6) Special procedures for situations or species of concern; and
- (7) Speed and course alterations.

#### Vessel-based Visual Mitigation Monitoring

Lamont-Doherty would position observers aboard the seismic source vessel to watch for marine mammals near the vessel during daytime airgun operations and during any start-ups at night. Observers would also watch for marine mammals near the seismic vessel for at least 30 minutes prior to the start of airgun operations after an extended shutdown (i.e., greater than approximately eight minutes for this proposed cruise). When feasible, the observers would conduct observations during daytime periods when the seismic system is not operating for comparison of sighting rates and behavior with and without airgun operations and between acquisition periods. Based on the observations, the Langseth would power down or shutdown the airguns when marine mammals are observed within or about to enter a designated 180-dB with buffer or 190-dB with buffer exclusion zone in shallow water depths or the designated 180-dB or 190-dB exclusion zone in intermediate or deep water depths.

During seismic operations, at least four protected species observers would be aboard the Langseth. Lamont-Doherty would appoint the observers with our concurrence and they would

conduct observations during ongoing daytime operations and nighttime ramp-ups of the airgun array. During the majority of seismic operations, two observers would be on duty from the observation tower to monitor marine mammals near the seismic vessel. Using two observers would increase the effectiveness of detecting animals near the source vessel. However, during mealtimes and bathroom breaks, it is sometimes difficult to have two observers on effort, but at least one observer would be on watch during bathroom breaks and mealtimes. Observers would be on duty in shifts of no longer than four hours in duration.

Two observers on the Langseth would also be on visual watch during all nighttime ramp-ups of the seismic airguns. A third observer would monitor the passive acoustic monitoring equipment 24 hours a day to detect vocalizing marine mammals present in the action area. In summary, a typical daytime cruise would have scheduled two observers (visual) on duty from the observation tower, and an observer (acoustic) on the passive acoustic monitoring system. Before the start of the seismic survey, Lamont-Doherty would instruct the vessel's crew to assist in detecting marine mammals and implementing mitigation requirements.

The Langseth is a suitable platform for marine mammal observations. When stationed on the observation platform, the eye level would be approximately 21.5 m (70.5 ft) above sea level, and the observer would have a good view around the entire vessel. During daytime, the observers would scan the area around the vessel systematically with reticle binoculars (e.g., 7 x 50 Fujinon), Big-eye binoculars (25 x 150), and with the naked eye. During darkness, night vision devices would be available (ITT F500 Series Generation 3 binocular-image intensifier or equivalent), when required. Laser range-finding binoculars (Leica LRF 1200 laser rangefinder or equivalent) would be available to assist with distance estimation. They are useful in training observers to estimate distances visually, but are generally not useful in measuring distances to animals directly. The user measures distances to animals with the reticles in the binoculars.

When the observers see marine mammals within or about to enter the designated exclusion zone the Langseth would immediately power down or shutdown the airguns. The observer(s) would continue to maintain watch to determine when the animal(s) are outside the exclusion zone by visual confirmation. Airgun operations would not resume until the observer has confirmed that the animal has left the zone, or if not observed after 15 minutes for species with shorter dive durations (small odontocetes and pinnipeds); 30 minutes for mysticetes and large odontocetes; and 60 minutes for sperm and beaked whales.

Exclusion Zones: Lamont-Doherty would use safety radii to designate exclusion zones and to estimate take for marine mammals. Table 3 shows the distances at which a marine mammal could potentially receive sound from the 18-airgun array, 36-airgun array, and a single airgun.

**Table 3**– Distances to which sound levels greater than or equal to 160, 180, and 190 dB re: 1  $\mu$ Pa could be received during the proposed survey offshore North Carolina in the Atlantic Ocean, September - October, 2014.

Source and Volume (in <sup>3</sup> )	Tow Depth (m)	Water Depth (m)	Predicted RMS Distances <sup>1</sup> (m)				
			190 dB with Buffer	190 dB	180 dB with Buffer	180 dB	160 dB
Single Bolt airgun (40 in <sup>3</sup> )	6 or 9	< 100	37 <sup>3</sup>	27 <sup>3</sup>	121 <sup>3</sup>	86 <sup>3</sup>	938 <sup>3</sup>
		100-1,000	-	-	100	100	582 <sup>2</sup>
		> 1,000	-	-	100	100	388 <sup>1</sup>
18-Airgun array (3,300 in <sup>3</sup> )	6	< 100	436 <sup>4</sup>	294 <sup>4</sup>	1,628 <sup>4</sup>	1,097 <sup>4</sup>	15,280 <sup>4</sup>
		100-1,000	-	-	-	675 <sup>2</sup>	5,640 <sup>2</sup>
		> 1,000	-	-	-	450 <sup>1</sup>	3,760 <sup>1</sup>
36-Airgun array (6,600 in <sup>3</sup> )	9	< 100	877 <sup>3</sup>	645 <sup>3</sup>	2,838 <sup>3</sup>	2,060 <sup>3</sup>	22,600 <sup>3</sup>
		100-1,000	-	-	-	1,391 <sup>2</sup>	8,670 <sup>2</sup>
		> 1,000	-	-	-	927 <sup>1</sup>	5,780 <sup>1</sup>

<sup>1</sup> Based on Lamont-Doherty modeling results.

<sup>2</sup> Predicted distances based on model results with a 1.5 correction factor between deep and intermediate water depths.

<sup>3</sup> Predicted distances based on empirically-derived measurements in the Gulf of Mexico with scaling factor applied to account for differences in tow depth.

<sup>4</sup> Predicted distances based on empirically-derived measurements in the Gulf of Mexico.

The 180- or 190-dB level shutdown criteria are applicable to cetaceans and pinnipeds as specified by NMFS (2000). To be conservative, we are requiring Lamont-Doherty to also establish

exclusion zones for the shallow water (less than 100 m) portion of the survey based upon the 190-dB with buffer and 180-dB with buffer isopleths which are approximately 3-dB lower than NMFS' existing shutdown criteria.

If the protected species visual observer detects marine mammal(s) within or about to enter the appropriate exclusion zone, the Langseth crew would immediately power down the airgun array, or perform a shutdown if necessary (see Shut-down Procedures).

Power Down Procedures—A power down involves decreasing the number of airguns in use such that the radius of the 180-dB with buffer or 190-dB with buffer exclusion zone in shallow water depths or the designated 180-dB or 190-dB exclusion zone in intermediate or deep water is smaller to the extent that marine mammals are no longer within or about to enter the exclusion zone. A power down of the airgun array can also occur when the vessel is moving from one seismic line to another. During a power down for mitigation, the Langseth would operate one airgun (40 in<sup>3</sup>). The continued operation of one airgun would alert marine mammals to the presence of the seismic vessel in the area. A shutdown occurs when the Langseth suspends all airgun activity.

If the observer detects a marine mammal outside the exclusion zone and the animal is likely to enter the zone, the crew would power down the airguns to reduce the size of the 180-dB with buffer or 190-dB with buffer exclusion zone in shallow water depths or the designated 180-dB or 190-dB exclusion zone in intermediate or deep water before the animal enters that zone. Likewise, if a mammal is already within the zone after detection, the crew would power-down the airguns immediately. During a power down of the airgun array, the crew would operate a single 40-in<sup>3</sup> airgun which has a smaller exclusion zone. If the observer detects a marine mammal within or near the smaller exclusion zone around the airgun (Table 2), the crew would shut down the single airgun (see next section).

Resuming Airgun Operations After a Power Down - Following a power-down, the Langseth

crew would not resume full airgun activity until the marine mammal has cleared the 180-dB with buffer or 190-dB with buffer exclusion zone in shallow water depths or the designated 180-dB or 190-dB exclusion zone (see Table 2). The observers would consider the animal to have cleared the exclusion zone if:

- The observer has visually observed the animal leave the exclusion zone; or
- An observer has not sighted the animal within the exclusion zone for 15 minutes for species with shorter dive durations (i.e., small odontocetes or pinnipeds), or 30 minutes for mysticetes and large odontocetes; or 60 minutes for sperm and beaked whales.

The Langseth crew would resume operating the airguns at full power after 15 minutes for species with shorter dive durations (small odontocetes and pinnipeds); 30 minutes for mysticetes and large odontocetes; and 60 minutes for sperm and beaked whales.

We estimate that the Langseth would transit outside the original the 180-dB with buffer or 190-dB with buffer exclusion zone in shallow water depths or the designated 180-dB or 190-dB exclusion zone after an 8-minute wait period. This period is the average speed of the Langseth while operating the airguns (8.5 km/h; 5.3 mph). Because the vessel has transited away from the vicinity of the original sighting during the 8-minute period, implementing ramp-up procedures for the full array after an extended power down (i.e., transiting for an additional 35 minutes from the location of initial sighting) would not meaningfully increase the effectiveness of observing marine mammals approaching or entering the exclusion zone for the full source level and would not further minimize the potential for take. The Langseth's observers are continually monitoring the exclusion zone for the full source level while the mitigation airgun is firing. On average, observers can observe to the horizon (10 km; 6.2 mi) from the height of the Langseth's observation deck and should be able to say with a reasonable degree of confidence whether a marine mammal would be encountered within this distance before resuming airgun operations at full power.

Shutdown Procedures – The Langseth crew would shut down the operating airgun(s) if they see a marine mammal within or approaching the exclusion zone for the single airgun. The crew would implement a shutdown:

(1) If an animal enters the exclusion zone of the single airgun after the crew has initiated a power down; or

(2) If an observer sees the animal is initially within the exclusion zone of the single airgun when more than one airgun (typically the full airgun array) is operating.

Considering the conservation status for North Atlantic right whales, the Langseth crew would shut down the airgun(s) immediately in the unlikely event that observers detect this species, regardless of the distance from the vessel. The Langseth would only begin ramp-up if observers have not seen the North Atlantic right whale for 30 minutes.

Resuming Airgun Operations After a Shutdown - Following a shutdown in excess of eight minutes, the Langseth crew would initiate a ramp-up with the smallest airgun in the array (40-in<sup>3</sup>). The crew would turn on additional airguns in a sequence such that the source level of the array would increase in steps not exceeding 6 dB per five-minute period over a total duration of approximately 30 minutes. During ramp-up, the observers would monitor the exclusion zone, and if he/she sees a marine mammal, the Langseth crew would implement a power down or shutdown as though the full airgun array were operational.

During periods of active seismic operations, there are occasions when the Langseth crew would need to temporarily shut down the airguns due to equipment failure or for maintenance. In this case, if the airguns are inactive longer than eight minutes, the crew would follow ramp-up procedures for a shutdown described earlier and the observers would monitor the full exclusion zone and would implement a power down or shutdown if necessary.

If the full exclusion zone is not visible to the observer for at least 30 minutes prior to the start of

operations in either daylight or nighttime, the Langseth crew would not commence ramp-up unless at least one airgun (40-in<sup>3</sup> or similar) has been operating during the interruption of seismic survey operations. Given these provisions, it is likely that the vessel's crew would not ramp up the airgun array from a complete shutdown at night or in thick fog, because the outer part of the zone for that array would not be visible during those conditions.

If one airgun has operated during a power down period, ramp-up to full power would be permissible at night or in poor visibility, on the assumption that marine mammals, alerted to the approaching seismic vessel by the sounds from the single airgun, could move away from the vessel. The vessel's crew would not initiate a ramp-up of the airguns if an observer sees the marine mammal within or near the applicable exclusion zones during the day or close to the vessel at night.

Ramp-up Procedures – Ramp-up of an airgun array provides a gradual increase in sound levels, and involves a step-wise increase in the number and total volume of airguns firing until the full volume of the airgun array is achieved. The purpose of a ramp-up is to “warn” marine mammals in the vicinity of the airguns, and to provide the time for them to leave the area and thus avoid any potential injury or impairment of their hearing abilities. Lamont-Doherty would follow a ramp-up procedure when the airgun array begins operating after an 8-minute period without airgun operations or when shut down has exceeded that period. Lamont-Doherty has used similar waiting periods (approximately eight to 10 minutes) during previous seismic surveys.

Ramp-up would begin with the smallest airgun in the array (40 in<sup>3</sup>). The crew would add airguns in a sequence such that the source level of the array would increase in steps not exceeding 6 dB per five minute period over a total duration of approximately 30 to 35 minutes. During ramp-up, the observers would monitor the exclusion zone, and if marine mammals are sighted, Lamont-Doherty would implement a power-down or shut-down as though the full airgun array were operational.

If the complete exclusion zone has not been visible for at least 30 minutes prior to the start of



operations in either daylight or nighttime, Lamont-Doherty would not commence the ramp-up unless at least one airgun (40 in<sup>3</sup> or similar) has been operating during the interruption of seismic survey operations. Given these provisions, it is likely that the crew would not ramp up the airgun array from a complete shut-down at night or in thick fog, because the outer part of the exclusion zone for that array would not be visible during those conditions. If one airgun has operated during a power-down period, ramp-up to full power would be permissible at night or in poor visibility, on the assumption that marine mammals, alerted to the approaching seismic vessel by the sounds from the single airgun, could move away from the vessel. Lamont-Doherty would not initiate a ramp-up of the airguns if an observer sights a marine mammal within or near the applicable exclusion zones.

Special Procedures for Situations or Species of Concern – Lamont-Doherty will avoid concentrations of humpback, sei, fin, blue, and/or sperm whales if possible (i.e., exposing concentrations of animals to 160 dB), and will power down the array, if necessary. For purposes of this planned survey, a concentration or group of whales will consist of six or more individuals visually sighted that do not appear to be traveling (e.g., feeding, socializing, etc.).

Speed and Course Alterations – If during seismic data collection, Lamont-Doherty detects marine mammals outside the exclusion zone and, based on the animal's position and direction of travel, is likely to enter the exclusion zone, the Langseth would change speed and/or direction if this does not compromise operational safety. Due to the limited maneuverability of the primary survey vessel, altering speed and/or course can result in an extended period of time to realign the vessel. However, if the animal(s) appear likely to enter the exclusion zone, the Langseth would undertake further mitigation actions, including a power down or shut down of the airguns.

#### Mitigation Conclusions

We have carefully evaluated Lamont-Doherty's proposed mitigation measures in the context of ensuring that we prescribe the means of effecting the least practicable impact on the affected marine

mammal species and stocks and their habitat. Our evaluation of potential measures included consideration of the following factors in relation to one another:

- The manner in which, and the degree to which, the successful implementation of the measure is expected to minimize adverse impacts to marine mammals;
- The proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and
- The practicability of the measure for applicant implementation.

Any mitigation measure(s) prescribed by us should be able to accomplish, have a reasonable likelihood of accomplishing (based on current science), or contribute to the accomplishment of one or more of the general goals listed here:

1. Avoidance or minimization of injury or death of marine mammals wherever possible (goals 2, 3, and 4 may contribute to this goal).
2. A reduction in the numbers of marine mammals (total number or number at biologically important time or location) exposed to airgun operations that we expect to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing harassment takes only).
3. A reduction in the number of times (total number or number at biologically important time or location) individuals would be exposed to airgun operations that we expect to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing harassment takes only).
4. A reduction in the intensity of exposures (either total number or number at biologically important time or location) to airgun operations that we expect to result in the take of marine mammals (this goal may contribute to a, above, or to reducing the severity of harassment takes only).
5. Avoidance or minimization of adverse effects to marine mammal habitat, paying special attention to the food base, activities that block or limit passage to or from biologically important

areas, permanent destruction of habitat, or temporary destruction/disturbance of habitat during a biologically important time.

6. For monitoring directly related to mitigation—an increase in the probability of detecting marine mammals, thus allowing for more effective implementation of the mitigation.

Based on the evaluation of Lamont-Doherty’s proposed measures, as well as other measures considered, we have determined that the proposed mitigation measures provide the means of effecting the least practicable impact on marine mammal species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

### Monitoring

In order to issue an ITA for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth “requirements pertaining to the monitoring and reporting of such taking”. The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for Authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that we expect to be present in the proposed action area.

Lamont-Doherty submitted a marine mammal monitoring plan in section XIII of the Authorization application. We not repeat the description here as we have not changed the monitoring plan between the notice of proposed Authorization (79 FR 44549, July 31, 2014) and our final Authorization.

Monitoring measures prescribed by NMFS should accomplish one or more of the following general goals:

1. An increase in the probability of detecting marine mammals, both within the mitigation zone (thus allowing for more effective implementation of the mitigation) and during other times and locations, in order to generate more data to contribute to the analyses mentioned later;

2. An increase in our understanding of how many marine mammals would be affected by seismic airguns and other active acoustic sources and the likelihood of associating those exposures with specific adverse effects, such as behavioral harassment, temporary or permanent threshold shift;

3. An increase in our understanding of how marine mammals respond to stimuli that we expect to result in take and how those anticipated adverse effects on individuals (in different ways and to varying degrees) may impact the population, species, or stock (specifically through effects on annual rates of recruitment or survival) through any of the following methods:

a. Behavioral observations in the presence of stimuli compared to observations in the absence of stimuli (i.e., we need to be able to accurately predict received level, distance from source, and other pertinent information);

b. Physiological measurements in the presence of stimuli compared to observations in the absence of stimuli (i.e., we need to be able to accurately predict received level, distance from source, and other pertinent information);

c. Distribution and/or abundance comparisons in times or areas with concentrated stimuli versus times or areas without stimuli;

4. An increased knowledge of the affected species; and

5. An increase in our understanding of the effectiveness of certain mitigation and monitoring measures.

#### Monitoring Measures:

Lamont-Doherty proposes to sponsor marine mammal monitoring during the present project to supplement the mitigation measures that require real-time monitoring, and to satisfy the monitoring requirements of the Authorization. We have not changed the monitoring plan between the proposed Authorization and our final Authorization. Lamont-Doherty planned the monitoring work as a self-

contained project independent of any other related monitoring projects that may occur in the same regions at the same time. Further, Lamont-Doherty is prepared to discuss coordination of its monitoring program with any other related work that might be conducted by other groups working insofar as it is practical for them.

#### Vessel-Based Passive Acoustic Monitoring

Passive acoustic monitoring would complement the visual mitigation monitoring program, when practicable. Visual monitoring typically is not effective during periods of poor visibility or at night, and even with good visibility, is unable to detect marine mammals when they are below the surface or beyond visual range. Passive acoustical monitoring can improve detection, identification, and localization of cetaceans when used in conjunction with visual observations. The passive acoustic monitoring would serve to alert visual observers (if on duty) when vocalizing cetaceans are detected. It is only useful when marine mammals call, but it can be effective either by day or by night, and does not depend on good visibility. The acoustic observer would monitor the system in real time so that he/she can advise the visual observers if they acoustic detect cetaceans.

The passive acoustic monitoring system consists of hardware (i.e., hydrophones) and software. The “wet end” of the system consists of a towed hydrophone array connected to the vessel by a tow cable. The tow cable is 250 m (820.2 ft) long and the hydrophones fit within in the last 10 m (32.8 ft) of cable. A depth gauge, attached to the free end of the cable, is typically towed at depths less than 20 m (65.6 ft). The Langseth crew would deploy the array from a winch located on the back deck. A deck cable would connect the tow cable to the electronics unit in the main computer lab where the acoustic station, signal conditioning, and processing system would be located. The Pamguard software amplifies, digitizes, and then processes the acoustic signals received by the hydrophones. The system can detect marine mammal vocalizations at frequencies up to 250 kHz.

One acoustic observer, an expert bioacoustician with primary responsibility for the passive

acoustic monitoring system would be aboard the Langseth in addition to the four visual observers. The acoustic observer would monitor the towed hydrophones 24 hours per day during airgun operations and during most periods when the Langseth is underway while the airguns are not operating. However, passive acoustic monitoring may not be possible if damage occurs to both the primary and back-up hydrophone arrays during operations. The primary passive acoustic monitoring streamer on the Langseth is a digital hydrophone streamer. Should the digital streamer fail, back-up systems should include an analog spare streamer and a hull-mounted hydrophone.

One acoustic observer would monitor the acoustic detection system by listening to the signals from two channels via headphones and/or speakers and watching the real-time spectrographic display for frequency ranges produced by cetaceans. The observer monitoring the acoustical data would be on shift for one to six hours at a time. The other observers would rotate as an acoustic observer, although the expert acoustician would be on passive acoustic monitoring duty more frequently.

When the acoustic observer detects a vocalization while visual observations are in progress, the acoustic observer on duty would contact the visual observer immediately, to alert him/her to the presence of cetaceans (if they have not already been seen), so that the vessel's crew can initiate a power down or shutdown, if required. During non-daylight hours, when the acoustic monitoring system detects a cetacean which may be close to the source vessel, the acoustic observer would notify the Langseth crew immediately so that the proper mitigation measure may be implemented. The observer would enter the information regarding the call into a database. Data entry would include an acoustic encounter identification number, whether it was linked with a visual sighting, date, time when first and last heard and whenever any additional information was recorded, position and water depth when first detected, bearing if determinable, species or species group (e.g., unidentified dolphin, sperm whale), types and nature of sounds heard (e.g., clicks, continuous,

sporadic, whistles, creaks, burst pulses, strength of signal, etc.), and any other notable information. Acousticians record the acoustic detection for further analysis.

#### Observer Data and Documentation

Observers would record data to estimate the numbers of marine mammals exposed to various received sound levels and to document apparent disturbance reactions or lack thereof. They would use the data to estimate numbers of animals potentially ‘taken’ by harassment (as defined in the MMPA). They will also provide information needed to order a power down or shut down of the airguns when a marine mammal is within or near the exclusion zone.

When an observer makes a sighting, they will record the following information:

1. Species, group size, age/size/sex categories (if determinable), behavior when first sighted and after initial sighting, heading (if consistent), bearing and distance from seismic vessel, sighting cue, apparent reaction to the airguns or vessel (e.g., none, avoidance, approach, paralleling, etc.), and behavioral pace.

2. Time, location, heading, speed, activity of the vessel, sea state, visibility, and sun glare.

The observer will record the data listed under (2) at the start and end of each observation watch, and during a watch whenever there is a change in one or more of the variables.

Observers will record all observations and power downs or shutdowns in a standardized format and will enter data into an electronic database. The observers will verify the accuracy of the data entry by computerized data validity checks during data entry and by subsequent manual checking of the database. These procedures will allow the preparation of initial summaries of data during and shortly after the field program, and will facilitate transfer of the data to statistical, graphical, and other programs for further processing and archiving.

Results from the vessel-based observations will provide:

1. The basis for real-time mitigation (airgun power down or shutdown).

2. Information needed to estimate the number of marine mammals potentially taken by harassment, which Lamont-Doherty must report to the Office of Protected Resources.
3. Data on the occurrence, distribution, and activities of marine mammals and turtles in the area where Lamont-Doherty would conduct the seismic study.
4. Information to compare the distance and distribution of marine mammals and turtles relative to the source vessel at times with and without seismic activity.
5. Data on the behavior and movement patterns of marine mammals detected during non-active and active seismic operations.

### Reporting

Lamont-Doherty would submit a report to us and to the Foundation within 90 days after the end of the cruise. The report would describe the operations conducted and sightings of marine mammals and turtles near the operations. The report would provide full documentation of methods, results, and interpretation pertaining to all monitoring. The 90-day report would summarize the dates and locations of seismic operations, and all marine mammal sightings (dates, times, locations, activities, associated seismic survey activities). The report would also include estimates of the number and nature of exposures that could result in “takes” of marine mammals by harassment or in other ways.

In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner not permitted by the authorization (if issued), such as an injury, serious injury, or mortality (e.g., ship-strike, gear interaction, and/or entanglement), Lamont-Doherty shall immediately cease the specified activities and immediately report the take to the Incidental Take Program Supervisor, Permits and Conservation Division, Office of Protected Resources, NMFS, at 301-427-8401 and/or by email to [Jolie.Harrison@noaa.gov](mailto:Jolie.Harrison@noaa.gov) and [ITP.Cody@noaa.gov](mailto:ITP.Cody@noaa.gov). Lamont-Doherty must also contact the NMFS Greater Atlantic Region Marine Mammal Stranding Network at 866-755-6622 ([Mendy.Garron@noaa.gov](mailto:Mendy.Garron@noaa.gov)), and the NMFS Southeast Region Marine Mammal



Stranding Network at 877-433-8299 ([Blair.Mase@noaa.gov](mailto:Blair.Mase@noaa.gov) and [Erin.Fougeres@noaa.gov](mailto:Erin.Fougeres@noaa.gov)). The report must include the following information:

- Time, date, and location (latitude/longitude) of the incident;
- Name and type of vessel involved;
- Vessel's speed during and leading up to the incident;
- Description of the incident;
- Status of all sound source use in the 24 hours preceding the incident;
- Water depth;
- Environmental conditions (e.g., wind speed and direction, Beaufort sea state, cloud cover, and visibility);
- Description of all marine mammal observations in the 24 hours preceding the incident;
- Species identification or description of the animal(s) involved;
- Fate of the animal(s); and
- Photographs or video footage of the animal(s) (if equipment is available).

Lamont-Doherty shall not resume its activities until we are able to review the circumstances of the prohibited take. We shall work with Lamont-Doherty to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. Lamont-Doherty may not resume their activities until notified by us via letter, email, or telephone.

In the event that Lamont-Doherty discovers an injured or dead marine mammal, and the lead visual observer determines that the cause of the injury or death is unknown and the death is relatively recent (i.e., in less than a moderate state of decomposition as we describe in the next paragraph), Lamont-Doherty will immediately report the incident to the Incidental Take Program Supervisor, Permits and Conservation Division, Office of Protected Resources, NMFS, at 301-427-

8401 and/or by email to [Jolie.Harrison@noaa.gov](mailto:Jolie.Harrison@noaa.gov) and [ITP.Cody@noaa.gov](mailto:ITP.Cody@noaa.gov). Lamont-Doherty must also contact the NMFS Greater Atlantic Region Marine Mammal Stranding Network at 866-755-6622 ([Mendy.Garron@noaa.gov](mailto:Mendy.Garron@noaa.gov)), and the NMFS Southeast Region Marine Mammal Stranding Network at 877-433-8299 ([Blair.Mase@noaa.gov](mailto:Blair.Mase@noaa.gov) and [Erin.Fougeres@noaa.gov](mailto:Erin.Fougeres@noaa.gov)). The report must include the same information identified in the paragraph above this section. Activities may continue while we review the circumstances of the incident. We would work with Lamont-Doherty to determine whether modifications in the activities are appropriate.

In the event that Lamont-Doherty discovers an injured or dead marine mammal, and the lead visual observer determines that the injury or death is not associated with or related to the authorized activities (e.g., previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), Lamont-Doherty would report the incident to the Incidental Take Program Supervisor, Permits and Conservation Division, Office of Protected Resources, NMFS, at 301-427-8401 and/or by email to [Jolie.Harrison@noaa.gov](mailto:Jolie.Harrison@noaa.gov) and [ITP.Cody@noaa.gov](mailto:ITP.Cody@noaa.gov) within 24 hours of the discovery . Lamont-Doherty must also contact the NMFS Greater Atlantic Region Marine Mammal Stranding Network at 866-755-6622 ([Mendy.Garron@noaa.gov](mailto:Mendy.Garron@noaa.gov)) and the NMFS Southeast Region Marine Mammal Stranding Network at 877-433-8299 ([Blair.Mase@noaa.gov](mailto:Blair.Mase@noaa.gov) and [Erin.Fougeres@noaa.gov](mailto:Erin.Fougeres@noaa.gov)) within 24 hours of the discovery. Activities may continue while NMFS reviews the circumstances of the incident. The Observatory would provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS.

#### Estimated Take by Incidental Harassment

Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns,

including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

Acoustic stimuli (i.e., increased underwater sound) generated during the operation of the airgun sub-arrays have the potential to result in the behavioral disturbance of some marine mammals. Thus, we propose to authorize take by Level B harassment resulting from the operation of the sound sources for the proposed seismic survey based upon the current acoustic exposure criteria shown in Table 4. Our practice has been to apply the 160 dB re: 1  $\mu$ Pa received level threshold for underwater impulse sound levels to determine whether take by Level B harassment occurs. Southall *et al.* (2007) provides a severity scale for ranking observed behavioral responses of both free-ranging marine mammals and laboratory subjects to various types of anthropogenic sound (see Table 4 in Southall *et al.* [2007]).

**Table 4 - NMFS' Current Acoustic Exposure Criteria**

Criterion	Criterion Definition	Threshold
Level A Harassment (Injury)	Permanent Threshold Shift (PTS) (Any level above that which is known to cause TTS)	180 dB re 1 microPa-m (cetaceans) / 190 dB re 1 microPa-m (pinnipeds) root mean square (rms)
Level B Harassment	Behavioral Disruption (for impulse noises)	160 dB re 1 microPa-m (rms)

The probability of vessel and marine mammal interactions (i.e., ship strike) occurring during the proposed survey is unlikely due to the Langseth's slow operational speed, which is typically 4.6 kts (8.5 km/h; 5.3 mph). Outside of seismic operations, the Langseth's cruising speed would be approximately 11.5 mph (18.5 km/h; 10 kts) which is generally below the speed at which studies have noted reported increases of marine mammal injury or death (Laist *et al.*, 2001). In addition, the Langseth has a number of other advantages for avoiding ship strikes as compared to most commercial merchant vessels, including the following: the Langseth's bridge offers good visibility to visually monitor for marine mammal presence; observers posted during operations scan the ocean for marine mammals and must report visual alerts of marine mammal presence to crew; and the

observers receive extensive training that covers the fundamentals of visual observing for marine mammals and information about marine mammals and their identification at sea. Thus, we do not anticipate that take, in the form of vessel strike, would result from the movement of the vessel.

Lamont-Doherty did not estimate any additional take allowance for animals that could be affected by sound sources other than the airguns and they will not operate the multibeam echosounder, sub-bottom profiler, and acoustic Doppler current profiler during transits to and from the survey area. We do not expect that the sound levels produced by the multi-beam echosounder, sub-bottom profiler, and the acoustic Doppler current profiler would exceed the sound levels produced by the airguns for the majority of the time. Because of the beam pattern and directionality of these sources, combined with their lower source levels, it is not likely that these sources would take marine mammals independently from the takes that Lamont-Doherty has estimated to result from airgun operations. Therefore, we do not believe it is necessary to authorize additional takes for these sources for the action at this time. We are currently evaluating the broader use of these types of sources to determine under what specific circumstances coverage for incidental take would or would not be advisable. We are working on guidance that would outline a consistent recommended approach for applicants to address the potential impacts of these types of sources.

NMFS considers the probability for entanglement of marine mammals to be low because of the vessel speed and the monitoring efforts onboard the survey vessel. Therefore, NMFS does not believe it is necessary to authorize additional takes for entanglement at this time.

There is no evidence that planned activities could result in serious injury or mortality within the specified geographic area for the requested Authorization. The required mitigation and monitoring measures would minimize any potential risk for serious injury or mortality.

The following sections describe Lamont-Doherty's methods to estimate take by incidental harassment. Lamont-Doherty based their estimates on the number of marine mammals that could be

harassed by seismic operations with the airgun array during approximately 5,320 km (3,305 mi) of transect lines in the Atlantic Ocean.

Ensonified Area Calculations: In order to estimate the potential number of marine mammals exposed to airgun sounds, Lamont-Doherty considers the total marine area within the 160-dB radius around the operating airguns. This ensonified area includes areas of overlapping transect lines. They determine the ensonified area by entering the planned survey lines into a MapInfo GIS, using the software to identify the relevant areas by “drawing” the applicable 160-dB buffer (see Table 2) around each seismic line, and then calculating the total area within the buffers. The revised total ensonified area without overlap is approximately 40,968 km<sup>2</sup> (25,456 mi).

For this survey, Lamont-Doherty assumes that the Langseth will not need to repeat some tracklines, accommodate the turning of the vessel, address equipment malfunctions, or conduct equipment testing to complete the survey. Lamont-Doherty added a 25 percent contingency allowance in their application and draft EA to their ensonified area calculations for additional seismic operations in the survey area associated with infill of missing data, and/or repeat coverage of any areas where initial data quality was sub-standard; however, they have eliminated the contingency from their final calculations. Whereas Lamont-Doherty added this 25 percent contingency to some past seismic surveys, for this particular survey design, the additional contingency was not necessary and removed from the final calculations for the proposed activities. Thus, total tracklines for the proposed survey would not exceed 5,320 km.

Exposure Estimates: Lamont-Doherty calculates the numbers of different individuals potentially exposed to approximately 160 dB re: 1 µPa by multiplying the expected species density estimates (number/km<sup>2</sup>) for that area in the absence of a seismic program times the estimated area of ensonification (i.e., 40,968 km<sup>2</sup>; 25,456 mi).

Table 3 of their application presents their original estimates of the number of different

individual marine mammals that could potentially experience exposures greater than or equal to 160 dB re: 1  $\mu$ Pa during the seismic survey if no animals moved away from the survey vessel. Lamont-Doherty used the Strategic Environmental Research and Development Program’s (SERDP) spatial decision support system (SDSS) Marine Animal Model Mapper tool (Read et al. 2009) to calculate cetacean densities within the survey area based on the U.S. Navy’s “OPAREA Density Estimates” (NODE) model (DoN, 2007). The NODE model derives density estimates using density surface modeling of the existing line-transect data, which uses sea surface temperature, chlorophyll a, depth, longitude, and latitude to allow extrapolation to areas/seasons where marine mammal survey data collection did not occur. Lamont-Doherty used the SERDP SDSS tool to obtain mean densities within three polygons for each depth strata within seismic survey area for the cetacean species during the fall (September through November).

For the Authorization, we reviewed Lamont-Doherty’s take estimates presented in their application and addendum and revised the take calculations for several species based upon the best available information from additional sources including the Cetacean and Turtle Assessment Program (CeTAP) surveys (CeTAP, 1982); the Atlantic Marine Assessment Program for Protected Species (AMAPPS) surveys in 2010, 2011, 2012, and 2013; the Navy’s Marine Species Density Database (NMSDD); Read *et al.*, 2003; and communications with regional experts. These include takes for blue, fin, minke, North Atlantic right, and sei whales; spinner dolphins, Fraser’s dolphins, bottlenose dolphins, melon-headed whales, pygmy killer whales, false killer whales, and killer whales; and harbor seals (see Table 4 for information sources).

Table 5 presents the revised estimates of the possible numbers of marine mammals exposed to sound levels greater than or equal to 160 dB re: 1  $\mu$ Pa during the proposed seismic survey.

**Table 5** – Proposed Level B harassment take levels, species or stock abundance, and percentage of population proposed for take during the proposed seismic survey in the Atlantic Ocean, September through October, 2014.

Species	Density Estimate <sup>1</sup> (#/1000 km <sup>2</sup> )	Modeled Number of Individuals	Proposed Take	Percent of Species or Stock <sup>4</sup>	Population Trend <sup>5</sup>
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		Exposed to Sound Levels ≥ 160 dB <sup>2</sup>	Authorization <sup>3</sup>		
<b>North Atlantic right whale</b>	0.13, 0.01, 0.001 <sup>6</sup>	5	5	1.25	Increasing
<b>Humpback whale</b>	0.73, 0.56, 1.06	38	44	5.24	Increasing
Minke whale	0.03, 0.02, 0.04	2	2	0.01	No data
<b>Sei whale</b>	1.69, 2.24, 2.19 <sup>6,7</sup>	86	98	27.34	No data
<b>Fin whale</b>	0.98, 0.48, 0.14 <sup>6,7</sup>	16	19	0.52	No data
<b>Blue whale</b>	0.003, 0.02, 0.03 <sup>6,7</sup>	2	3	0.52	No data
Bryde's whale	0.429, 0.429, 0.429 <sup>6</sup>	18	20	No data	No data
<b>Sperm whale</b>	0.03, 0.68, 3.23	91	104	6.48	No data
Dwarf sperm whale	0.64, 0.49, 0.93	34	39	1.01	No data
Pygmy sperm whale	0.64, 0.49, 0.93	34	39	1.01	No data
Cuvier's beaked whale	0.01, 0.14, 0.58	17	19	0.29	No data
Blainville's beaked whale	0.01, 0.14, 0.58	17	19	0.26	No data
Gervais' beaked whale	0.01, 0.14, 0.58	17	19	0.26	No data
True's beaked whale	0.01, 0.14, 0.58	17	19	0.26	No data
Rough-toothed dolphin	0.30, 0.23, 0.44	16	18	6.62	No data
Bottlenose dolphin (Offshore)	70.4, 331, 49.4	3,374	3,829	4.94	No data
Bottlenose dolphin (SMC)	70.4, 0, 0	686	778	8.01	No data
Bottlenose dolphin (SNCEs)	70.4, 0, 0	1 <sup>7</sup>	23 <sup>8</sup>	12.07	No data
Bottlenose dolphin (NNCEs)	70.4, 0, 0	1 <sup>7</sup>	7 <sup>8</sup>	0.72	No data
Pantropical spotted dolphin	14, 10.7, 20.4	732	830	24.9	No data
Atlantic spotted dolphin	216.5, 99.7, 77.4	4,616	5,239	11.72	No data
Spinner dolphin	0, 0, 0	65 <sup>8</sup>	74	No data	No data
Striped dolphin	0, 0.4, 3.53	98	112	0.20	No data
Clymene dolphin	6.7, 5.12, 9.73	351	398	No data	No data
Short-beaked comm. dolphin	5.8, 138.7, 26.4	1,338	1,519	0.88	No data
Atlantic white-sided dolphin	0, 0, 0	0	0	0	No data
Fraser's dolphin	0, 0, 0	100 <sup>8</sup>	114	No data	No data
Risso's dolphin	1.18, 4.28, 2.15	88	100	0.54	No data
Melon-headed whale	0, 0, 0	100 <sup>8</sup>	100	No data	No data
False killer whale	0, 0, 0	15 <sup>8</sup>	18	No data	No data
Pygmy killer whale	0, 0, 0	25 <sup>8</sup>	29	No data	No data
Killer whale	0, 0, 0	6 <sup>8</sup>	7	No data	No data
Long-finned pilot whale	3.74, 58.9, 19.1	795	903	3.4	No data
Short-finned pilot whale	3.74, 58.9, 19.1	795	903	4.19	No data
Harbor porpoise	0, 0, 0	0	0	0	No data
Harbor seal	0, 0, 0	4 <sup>8</sup>	5	0.01	No data

<sup>1</sup> Except where noted, densities are the mean values for the shallow (<100 m), intermediate (100-1,000m), and deep (>1,000m) water stratum in the survey area calculated from the SERDP SDSS NODES fall model (Read *et al.*, 2009) as presented in Table 3 of Lamont-Doherty's application.

<sup>2</sup> Modeled take in this table corresponds to the total modeled take over all depth ranges within a total ensonified area of 40,968 km<sup>2</sup>. See Table 3 of Lamont-Doherty's application for their original take estimates by shallow, intermediate, and deep strata. See Table 9 in Lamont-Doherty's EA for revised take estimates based on modifications to the tracklines to reduce the total ensonified area (40,968 km<sup>2</sup>).

<sup>3</sup> The Authorization includes additional coverage for those potential takes of individuals where Lamont-Doherty would repeat tracklines. This estimate accounts for overlap and turnover within the area to account for take of additional individuals that could experience Level B harassment within those areas where the tracklines overlap.

<sup>4</sup> Stock/species abundance estimates from Table 1 in this notice used in calculating the percentage of species/stock.

<sup>5</sup> Population trend information is from Waring *et al.*, 2014. No data = Insufficient data to determine population trend.

<sup>6</sup> Density data derived from the Navy's NMSDD.

<sup>7</sup> Density estimates revised from proposed density estimate (79 FR 44549, July 31, 2014).

<sup>8</sup> Density estimates revised from proposed density based on information from ESA section 7 consultation.

<sup>9</sup> Modeled estimate includes the area that is less than 3 km from shore ensonified to greater than or equal to 160 dB (10 km<sup>2</sup> total).

<sup>10</sup> Species presence offshore NC based on pers. com. with Dr. Caroline Good (2014) and Mr. McLellan (2014); group size estimates based on CETAP (1982) and AMAPPS surveys (NMFS, 2011, 2012, 2013, 2014) for odontocetes and pinnipeds; and Read *et al.*, 2003 for bottlenose dolphins.

## Encouraging and Coordinating Research

Lamont-Doherty would coordinate the planned marine mammal monitoring program associated with the seismic survey in the Atlantic Ocean with applicable U.S. agencies.

## Analysis and Determinations

### Negligible Impact

Negligible impact' is "an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival" (50 CFR 216.103). The lack of likely adverse effects on annual rates of recruitment or survival (i.e., population level effects) forms the basis of a negligible impact finding. Thus, an estimate of the number of Level B harassment takes, alone, is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be "taken" through behavioral harassment, we must consider other factors, such as the likely nature of any responses (their intensity, duration, etc.), the context of any responses (critical reproductive time or location, migration, etc.), as well as the number and nature of estimated Level A harassment takes, and the number of estimated mortalities, effects on habitat, and the status of the species.

In making a negligible impact determination, we consider:

- The number of anticipated injuries, serious injuries, or mortalities;
- The number, nature, and intensity, and duration of Level B harassment; and
- The context in which the takes occur (e.g., impacts to areas of significance, impacts to local populations, and cumulative impacts when taking into account successive/contemporaneous actions when added to baseline data);
- The status of stock or species of marine mammals (i.e., depleted, not depleted, decreasing, increasing, stable, impact relative to the size of the population);
- Impacts on habitat affecting rates of recruitment/survival; and



- The effectiveness of monitoring and mitigation measures to reduce the number or severity of incidental take.

For reasons stated previously in this document and based on the following factors, Lamont-Doherty's specified activities are not likely to cause long-term behavioral disturbance, permanent threshold shift, or other non-auditory injury, serious injury, or death. They include:

- The anticipated impacts of Lamont-Doherty's survey activities on marine mammals are temporary behavioral changes due to avoidance of the area.
- The likelihood that marine mammals approaching the survey area will likely travel through the area or opportunistically foraging within the vicinity. Marine mammals transiting within the vicinity of survey operations will be transient as no breeding, calving, pupping, or nursing areas, or haul-outs, overlap with the survey area.
- The low likelihood that North Atlantic right whales would be exposed to sound levels greater than or equal to 160 dB re: 1  $\mu$ Pa due to the requirement that the Langseth crew must shutdown the airgun(s) immediately if observers detect this species, at any distance from the vessel.
- The anticipated impacts of Lamont-Doherty's survey activities on marine mammals are temporary behavioral changes due to avoidance of the area.
- The likelihood that, given sufficient notice through relatively slow ship speed, we expect marine mammals to move away from a noise source that is annoying prior to its becoming potentially injurious;
- The availability of alternate areas of similar habitat value for marine mammals to temporarily vacate the survey area during the operation of the airgun(s) to avoid acoustic harassment;
- The expectation that the seismic survey would have no more than a temporary and minimal adverse effect on any fish or invertebrate species that serve as prey species for marine mammals,

and therefore consider the potential impacts to marine mammal habitat minimal;

- The relatively low potential for temporary or permanent hearing impairment and the likelihood that Lamont-Doherty would avoid this impact through the incorporation of the required monitoring and mitigation measures (including the incorporation of larger exclusion zones for Level A Harassment in shallow water, power-downs, and shutdowns); and
- The high likelihood that trained visual protected species observers would detect marine mammals at close proximity to the vessel.

NMFS does not anticipate that any injuries, serious injuries, or mortalities would occur as a result of Lamont-Doherty's proposed activities, and NMFS does not propose to authorize injury, serious injury, or mortality at this time.

We anticipate only behavioral disturbance to occur primarily in the form of avoidance behavior to the sound source during the conduct of the survey activities. Further, the increased size of the Level A harassment exclusion zones in shallow water would effect the least practicable impact marine mammals.

Table 5 in this document outlines the number of requested Level B harassment takes that we anticipate as a result of these activities. NMFS anticipates that 30 marine mammal species (6 mysticetes, 23 odontocetes, and 1 pinniped) under our jurisdiction would likely occur in the proposed action area. Of the marine mammal species under our jurisdiction that are known to occur or likely to occur in the study area, six of these species are listed as endangered under the ESA and depleted under the MMPA, including: the blue, fin, humpback, north Atlantic right, sei, and sperm whales.

Due to the nature, degree, and context of Level B (behavioral) harassment anticipated and described (see "Potential Effects on Marine Mammals" section in this notice), we do not expect the activity to impact rates of recruitment or survival for any affected species or stock. In addition, the

seismic surveys would not take place in areas of significance for marine mammal feeding, resting, breeding, or calving and would not adversely impact marine mammal habitat.

Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (i.e., 24 hour cycle). Behavioral reactions to noise exposure (such as disruption of critical life functions, displacement, or avoidance of important habitat) are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall et al., 2007). While we anticipate that the seismic operations would occur on consecutive days, the estimated duration of the survey would last no more than 33 days. Specifically, the airgun array moves continuously over 10s of kilometers daily, as do the animals, making it unlikely that the activity would continuously expose the same animals over multiple consecutive days. Additionally, the seismic survey would increase sound levels in the marine environment in a relatively small area surrounding the vessel (compared to the range of the animals), which is constantly travelling over distances, and some animals may only be exposed to and harassed by sound for less than a day.

In summary, we expect marine mammals to avoid the survey area, thereby reducing the risk of exposure and impacts. We do not anticipate disruption to reproductive behavior and there is no anticipated effect on annual rates of recruitment or survival of affected marine mammals.

Based on our analysis of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the proposed monitoring and mitigation measures, NMFS finds that the take resulting from Lamont-Doherty's proposed seismic survey would have a negligible impact on the affected marine mammal species or stocks.

#### Small Numbers

As mentioned previously, NMFS estimates that Lamont-Doherty's activities could potentially affect, by Level B harassment only, 30 species of marine mammals under our jurisdiction. For each species, these estimates constitute small numbers relative to the population size and we have

provided the regional population estimates for the marine mammal species that may be taken by Level B harassment in Table 5 in this notice.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the mitigation and monitoring measures, NMFS finds that Lamont-Doherty's proposed activity would take small numbers of marine mammals relative to the populations of the affected species or stocks.

#### Impact on Availability of Affected Species or Stock for Taking for Subsistence Uses

There are no relevant subsistence uses of marine mammals implicated by this action.

#### Endangered Species Act (ESA)

There are six marine mammal species that may occur in the proposed survey area, several are listed as endangered under the Endangered Species Act, including the blue, fin, humpback, north Atlantic right, sei, and sperm whales. Under section 7 of the ESA, the Foundation has initiated formal consultation with NMFS on the proposed seismic survey. NMFS (i.e., National Marine Fisheries Service, Office of Protected Resources, Permits and Conservation Division) also consulted with NMFS on the proposed issuance of an Authorization under section 101(a)(5)(D) of the MMPA. NMFS consolidated those consultations in a single Biological Opinion.

On September 12, 2014 the Endangered Species Act Interagency Cooperation Division issued an Opinion to us and the Foundation which concluded that the issuance of the Authorization and the conduct of the seismic survey were not likely to jeopardize the continued existence of blue, fin, humpback, North Atlantic right, sei, and sperm whales. The Opinion also concluded that the issuance of the Authorization and the conduct of the seismic survey would not affect designated critical habitat for these species.

#### National Environmental Policy Act (NEPA)

The Foundation has prepared an EA titled, "Environmental Assessment of a Marine

Geophysical Survey by the R/V Marcus G. Langseth in the Atlantic Ocean off Cape Hatteras, September – October, 2014,” prepared by LGL, Ltd. environmental research associates, on behalf of the Foundation and the Observatory. We have also prepared an EA titled, “Issuance of an Incidental Harassment Authorization to Lamont- Doherty Earth Observatory to Take Marine Mammals by Harassment Incidental to a Marine Geophysical Survey in the Atlantic Ocean Offshore North Carolina, September through October, 2014,” and FONSI in accordance with NEPA and NOAA Administrative Order 216-6. We provided relevant environmental information to the public through our notice of proposed Authorization (79 FR 44549, July 31, 2014) and considered public comments received prior to finalizing our EA and deciding whether or not to issue a Finding of No Significant Impact (FONSI). We concluded that issuance of an Incidental Harassment Authorization would not significantly affect the quality of the human environment and have issued a FONSI. Because of this finding, it is not necessary to prepare an environmental impact statement for the issuance of an Authorization to the Observatory for this activity. Our EA and FONSI for this activity are available upon request (see ADDRESSES).

#### Authorization

We have issued an Incidental Harassment Authorization to Lamont-Doherty for the take of marine mammals, incidental to conducting a marine seismic survey in the Atlantic Ocean, September 15, 2014 to October 31, 2014.

Dated: September 19, 2014.

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Perry F. Gayaldo,  
Deputy Director, Office of Protected Resources,  
National Marine Fisheries Service.

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